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Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R01-93/085
September 1993

PB94-963704

EPA

Superfund
Record of Decision:

Pease Air Force Base
(Operable Unit 2), NH

50272-101

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15. Supplementary Notes

PB94-963704

16. Abstract (Limit: 200 words)

The 3-acre Pease Air Force Base (Operable Unit 2) site is part of the 4,300-acre inactive Air Force base located in Newington and Portsmouth, Rockingham County, New Hampshire. Land use in the area is predominantly commercial and residential, with wetlands and woodlands areas located onsite. Current land use at the site is institutional, agricultural, abandoned land, and unoccupied residential. Three drainage ditches, the Upper Newfields Ditch, the Southern Ditch, and the Test Cell Ditch, which receive runoff from the site, intersect the water table and are discharge points for shallow ground water. The site has been divided into several zones. Zone 3 includes Buildings 244, 113, 229, 222 (Jet Engine Test Cell), 228, 119, 120, and 227. The Jet Engine Test Cell (JETC), known as Site 34, consists of Building 222, the JP-4 Tank Area, the Fuel Oil Tank/Waste Fuel Separator Area, the manhole area, the holding tanks area, and the aircraft parking apron. From 1970 until its closure in 1991, the Air Force used the JETC to test jet engines through complete power ranges using a process during which water was injected into the exhaust stack to reduce exhaust temperature, hydrocarbon emissions, and noise. Runoff from the tests and washdown activities was routed through an oil/water separator and then discharged directly into

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Pease Air Force Base (Operable Unit 2), NH
Second Remedial Action
Contaminated Media: soil, debris, gw
Key Contaminants: VOCs (benzene, TCE, toluene, xylenes), other organics (PAHs), metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 144
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

the Test Cell Ditch. A number of investigations conducted as part of the Department of Defense's Installation Restoration Program (IRP) in 1983, identified records that documented that releases of chemical waste from the JETC to surrounding soil had occurred from the oil/water separator. In 1989, modifications were made to eliminate wastewater discharged to the storm drain by collecting the water in two 3,000-gallon underground storage tanks (USTs). A pilot ground water remediation system, consisting of two bedrock recovery wells and a ground water treatment plant (GWTP), was constructed at Site 34 during 1990 and 1991. Ground water from the recovery wells is treated to remove iron, manganese, and dissolved organic contaminants, and then discharged onsite to the base sanitary sewer system. In addition to these actions under the IRP, the JETC drain system was reconfigured, and holding tanks were installed to eliminate discharges of effluent from the exhaust stack area to the Test Cell Ditch; floor drains in the Test Cell Bay were plugged to prevent contaminant discharges to the Test Cell Ditch; a heating oil tank suspected of leaking was abandoned; a buried JP-4 tank was removed; and an aboveground JP-4 tank equipped with appropriate spill containment was installed. This ROD addresses sources of contamination, ground water treatment, and debris removal at the JETC, as OU2. Future RODs will address ground water contamination in Zone 3 as well as sediment in site drainage ditches and wetlands, if necessary. The primary contaminants of concern affecting the soil, debris, and ground water are VOCs, including benzene, TCE, toluene, and xylenes; other organics, including PAHs; and metals, including arsenic, chromium, and lead.

The selected remedial action for this site includes excavating approximately 11,900 yd^3 of soil from the JP-4 Tank Area, the Fuel Oil Tank/Waste Fuel Separator Area, the manhole area, and the holding tank area; temporarily storing and dewatering 5,350 yd^3 of contaminated excavated soil onsite; treating the excavated soil offsite using incineration, thermal desorption, or asphalt batching, or disposing of it at a RCRA or Subtitle D landfill; disposing of excavated contaminated material at a location to be determined during the RD phase; backfilling approximately 6,550 yd^3 of soil not requiring treatment that was excavated to access contaminated soil; replacing the excavated areas with clean fill; treating ground water extracted as part of the excavation and/or dewatering process using the existing pilot GWTP, which utilizes potassium permanganate injection in conjunction with flow equalization, greensand filtration, and activated carbon adsorption, with onsite discharge to surface water; removing remaining onsite USTs and associated piping from the manhole and Test Cell Ditch; and conducting environmental monitoring. The estimated present worth cost for this remedial action is $1,169,298, which includes an estimated total O&M cost of $111,351.

PERFORMANCE STANDARDS OR GOALS:

Cleanup goals are based on State ARARs and SDWA MCLs. Chemical-specific soil cleanup goals include 1 mg/kg for benzene, ethylbenzene, toluene, and total xylenes. Chemical-specific ground water cleanup goals include arsenic 50 ug/l; benzene 5 ug/l; lead 15 ug/l; and TCE 5 ug/l in the excavation dewatering process, and benzene 0.005 mg/l; toluene 1 mg/l; and total xylenes 10 mg/l for application of the leaching model.

Record of Decision
For A
Source Area Remedial Action
At
Site 34

Pease Air Force Base, NH

September 1993

Prepared for:

Headquarters Air Force Base Disposal Agency (HQ AFBDA)
The Pentagon, Washington, DC 20330

Air Force Center for Environmental Excellence
Base Closure Division (AFCEE/ESB)
Brooks Air Force Base, TX 78235-5328

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DEPARTMENT OF THE AIR FORCE · UNITED STATES OF AMERICA

Record of Decision for a Source Area Remedial Action at Site 34 Pease Air Force Base, New Hampshire

September 1993

RECORD OF DECISION
SITE 34

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RECORD OF DECISION SUMMARY

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DECLARATION

SITE NAME AND LOCATION

Pease Air Force Base (PAFB), Site 34
New Hampshire

STATEMENT OF BASIS AND PURPOSE

This decision document presents a selected remedial action designed to reduce potential leaching of soil contaminants to groundwater at Site 34, Pease AFB, NH. This decision document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Contingency Plan. Through this document, the Air Force plans to remedy the threat to human health, welfare, or the environment posed by contaminated soil associated with Site 34. This decision is based on the Administrative Record for the site. The Administrative Record for this site is located at the Information Repository in Building 43 at Pease International Tradeport (Formerly Pease AFB, New Hampshire). The Administrative Record Index as applies to Site 34 may be found in Appendix E.

The State of New Hampshire Department of Environmental Services (NHDES) and the U.S. Environmental Protection Agency (USEPA) concur with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from Site 34 soils, if not addressed by implementing the response action selected in the Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This action addresses the principal threat posed by Site 34 by preventing endangerment of public health, welfare, or the environment by implementation of this ROD through remediation of the soil; thereby minimizing the leaching potential of soil contaminants to groundwater.

The selected remedy includes the excavation of contaminated soils and drainage piping associated with Site 34. Also included is groundwater extraction and treatment for excavation dewatering purposes. The treatment and/or disposal of soils removed from the site will include one of the following; thermal desorption elsewhere on the base, asphalt batching of the soils at an off-base vendor location, or disposal at a Subtitle D Landfill or RCRA facility, as deemed necessary at the time of remediation.

Groundwater will be extracted during soil removal activities and extraction will continue until backfilling with clean fill is completed. Contaminated groundwater will be extracted via a well and sump extraction system and will be treated at the existing Pilot Groundwater Treatment Plant (GWTP) at Site 34. The groundwater treatment technology to be used includes greensand filtration followed by activated carbon adsorption. Additional storage capacity would be required during remedial activities as the rate of extraction will likely be greater than the existing 20-25 gpm capacity of the GWTP.

The preferred discharge method for the treated water is the base wastewater treatment facility as the pilot GWTP already discharges to the base sewer system. However, coordination with the City of Portsmouth as the current operator, would be required prior to any additional discharges. Treated water must meet the pretreatment standards established by the operator of the base wastewater treatment facility. Ultimate discharge will be to the Piscataqua River under a National Pollutant Discharge Elimination System (NPDES) permit.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements, that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable. The method of disposal or treatment of the excavated soils will be determined during the remedial design phase. The determination will reflect the requirement of CERCLA ¶120(b)(1) that states "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility hazardous substances, pollutants or contaminants is a principal element, are to be preferred over remedial alternatives not involving such treatment". A review will be conducted by the Air Force, the USEPA, and the NHDES within five years after remediation to ensure that the remedy provided adequate protection of human health and the environment.

The foregoing represents the selection of a remedial action by the United States Air Force and the U.S. Environmental Protection Agency, Region I, with concurrence of the New Hampshire Department of Environmental Services.

Concur and Recommended for immediate implementation:

By: [signature] Date: 9/24/93

JAMES F. BOATRIGHT
Deputy Assistant Secretary of the Air Force
(Installations)

By: Paul Keough Date: 9-27-93
Paul G. Keough

Title: Acting Regional Administrator, USEPA

RECORD OF DECISION SUMMARY

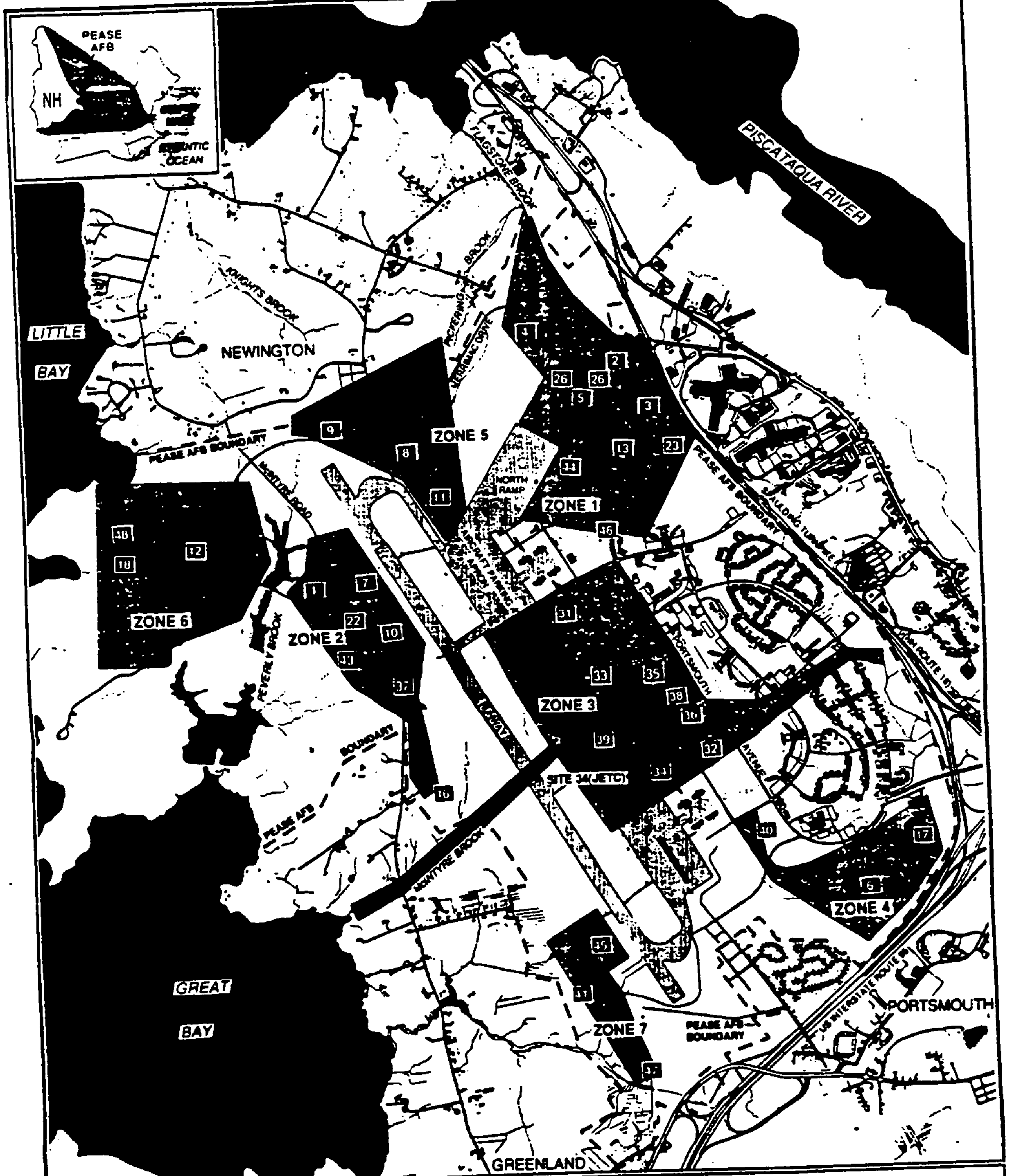
I. SITE NAME, LOCATION, AND DESCRIPTION

Pease AFB is a National Priorities List site consisting of numerous areas of contamination. This ROD addresses sources of contamination at the Jet Engine Test Cell (JETC) (also designated as Building 222 or Site 34). The JETC site occupies approximately 3 acres in the central portion of the former base. The JETC was used by the Air Force to test the performance of jet engines through complete power ranges.

The former base is located in the Town of Newington and the City of Portsmouth, both of which are in Rockingham County, New Hampshire. As shown in Figure 1, Pease AFB is located on a peninsula in southeastern New Hampshire. The peninsula is bounded on the west and southwest by Great Bay, on the northwest by Little Bay, and on the north and northeast by the Piscataqua River. The City of Portsmouth is located southeast of the base. Pease AFB occupies 4300 acres and is located approximately in the center of the peninsula.

The current land uses at Pease AFB are institutional, woodland, agricultural, abandoned land, and residential (currently unoccupied). Commercial and residential areas are located off base along Spaulding Turnpike, approximately 1,000 feet northeast of the Pease AFB eastern boundary, and Interstate I-95, which is located along the southeastern base boundary. The largest commercial complex is a shopping mall located on the eastern side of Spaulding Turnpike. Figure 2 is the general land use map for the Industrial Shop/Parking Apron (IS/PA) area of Pease AFB, and shows the location of the JETC within the IS/PA.

Prior to the construction of Pease AFB, the area at what is currently the JETC was primarily woodlands. The wetlands currently located on-site were not present before construction of the JETC facility, based on review of historic aerial photos. The development of the wetlands is thought to be due to the grading and paving activities associated with the aircraft parking apron and Dover Avenue.



LISTING OF CURRENT IRP SITES

SITE NO.	SITE NAME - (ABBREVIATION)	ZONE
1	Landfill 1 (LF-1)	2
2	Landfill 2 (LF-2)	1
3	Landfill 3 (LF-3)	1
4	Landfill 4 (LF-4)	1
5	Landfill 5 (LF-5)	1
6	Landfill 6 (LF-6)	4
7	Fire Department Training Area 1 (FDTA-1)	2
8	Fire Department Training Area 2 (FDTA-2)	5
9	Construction Rubble Dump 1 (CRD-1)	5
10	Leaded Fuel Tank Sludge Disposal Area (LFTS)	2
11	FMS Equipment Cleaning Site (FMS)	5
12	Munitions Maintenance Area (MMA)	6
13	Bulk Fuel Storage Area (BFSA)	1
16	Building 410 - PCB Spill	2
17	Construction Rubble Dump 2 (CRD-2)	4
18	Munitions Residue Burial Area (MRBA)	6
22	Burn Area 1 (BA-1)	2
23	Paute Brook	1
26	Flagstone Brook/Railway Ditch	1
31	Building 244	3
32	Building 113	3
33	Building 229	3
34	Building 222 - Jet Engine Test Cell (JETC)	3
35	Building 226	3
36	Building 118	3
37	Burn Area 2 (BA-2)	2
38	Building 120	3
39	Building 227	3
40	Auto Hobby Shop (AHS)	4
41	Golf Course Maintenance Area (GCMA)	7
43	McIntyre Road Drum Disposal Area (MRDDA)	2
44	Paint Can Disposal Area (PCDA)	4
45	Old Jet Engine Test Stand (OJETS)	7
46	RR Tracks Herbicides (RRTH)	1
47	Golf Course Pesticide Area (Mixing/Storage) (GCPA)	7
48	EOD Burn Detonation Area	6

NORTH

0 500 1000 2000 4000

SCALE IN FEET

Pease AFB

Base Map Source

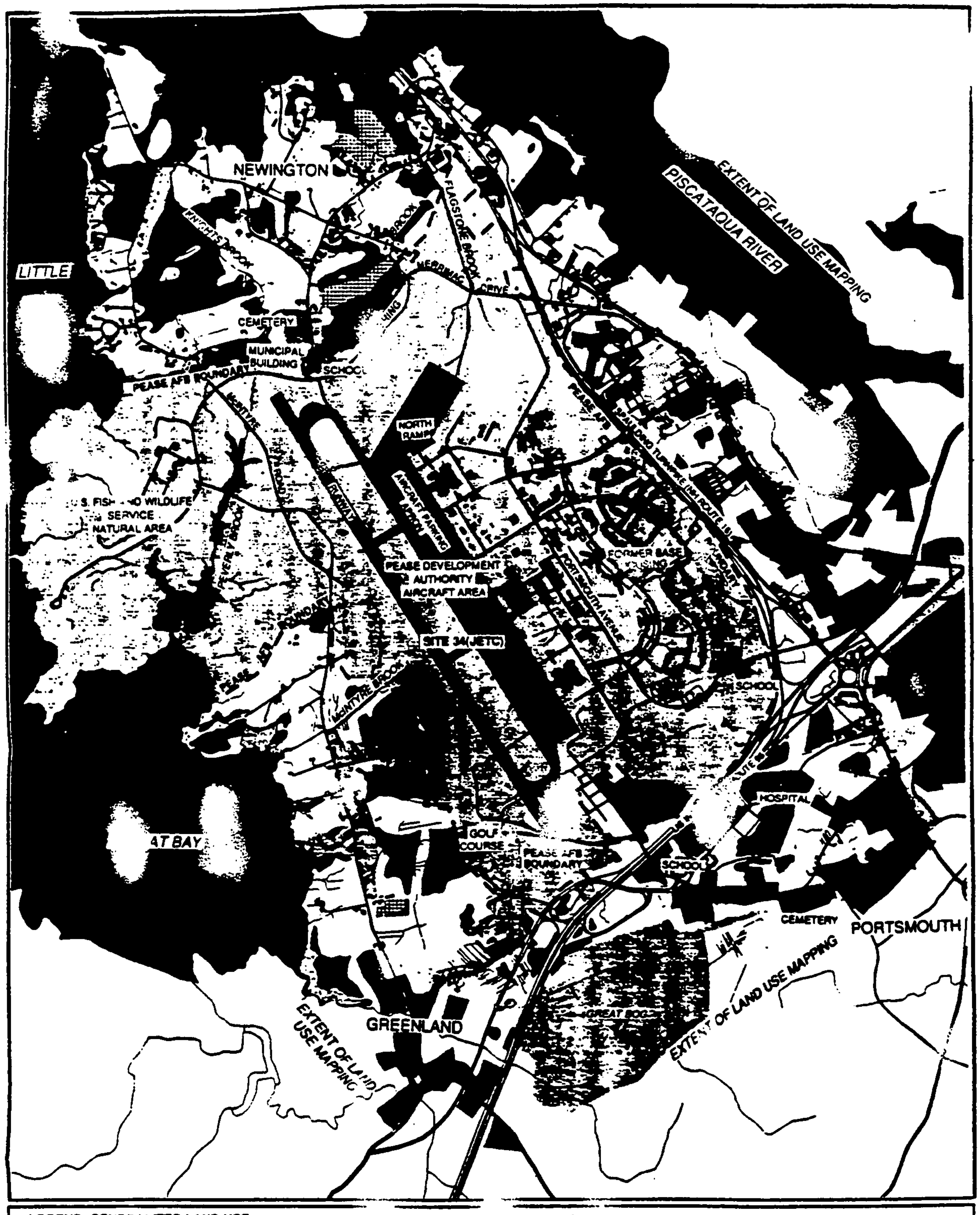
LEGEND:

Areal extent of IRP Zone

IRP Site

Site 34(JETC)
Stage 3, Record of Decision
Pease Air Force Base, New Hampshire

FIGURE 1
GENERAL LOCATIONS OF THE IRP



LEGEND: GENE?ALIZED LAND USE Land use was deve... from available ... including USGS topographic maps photorevised to 19... aerial photograph... base-wide photogrammetric mapping compilation based ... aerial photographs and WESTON personnel observations.

RESIDENTIAL
- Urban - medium to high density
- Rural - low density

COMMERCIAL
- Mixed retail/bussiness - major areas

INDUSTRIAL
- Mixed heavy through light - major areas

INSTITUTIONAL
- Public/Semipublic - schools, hospitals, municipal buildings, cemeteries, etc.
- Government owned ... Air Force Base mixed uses - cu...

TRANSPORT...
- Major highways, ... etc.

OPEN
- Water - surface water drainage
- ... area
- ... plantation
- ... area - large areas
- Open - Agricultural, undeveloped, other

SCALE

Pease AFB

NOTE:
1. Land use was developed to indicated general trends and shows only major uses with in areas.
2. Residential areas are not differentiated by type of housing, e.g. single, multi-family, etc
3. The base is ...

Site 34(JETC)
Stage 3, Record of Decision
Pease Air Force Base, New Hampshire

...URE 2

The primary sources of historic and current land use information for the JETC area include the USGS topographic quadrangle maps (Portsmouth Quadrangle, photorevised, 1981), aerial photographs (1958 to 1986), and a series of maps prepared for the New Hampshire Coastal Zone Study (1975).

Facilities adjacent to the JETC include an aircraft hangar (Building 227) to the north-northwest, the former Munitions Maintenance Squadron (Building 113), the former Jet Engine Maintenance Building (119) to the northeast, and the aircraft parking apron to the west.

Building 227 is currently leased from the Pease Development Authority (PDA) by Business Express (a Delta Commuter Airline) for aircraft storage and maintenance. Buildings 113 and 119 were given the designation Site 32/36, and are also being investigated under the IRP. Building 113 is currently leased to the U.S. Navy, and Building 119 is currently used by the PDA for maintenance activities. The aircraft parking apron is used for aircraft parking, refueling, and minor aircraft maintenance.

Surface drainageways at Pease AFB flow radially away from the center of the peninsula, toward Great Bay to the west, Little Bay to the northwest and north, and the Piscataqua River to the east. Great Bay, Little Bay, and the Piscataqua River are all tidally influenced and, consequently, are subjected to semidiurnal variation in water levels.

The peninsula has relatively low relief, with the runway and aircraft parking apron located on the topographically highest portion of the peninsula. The runway and aircraft parking apron are on a surface drainage divide, with runoff to the northeast of the divide ultimately discharging to the Piscataqua River, and runoff southwest of the divide ultimately discharging to Great Bay.

Locally, the surface hydrology of the JETC may be divided into four hydrologic zones: the paved and storm-drained aircraft parking apron, the relatively well-drained areas immediately adjacent to the aircraft parking apron, the poorly drained wetlands, and three drainage ditches, of which the Test Cell Ditch is one. The relationship of the 100-year floodplain to the JETC site is not known since floodplain location maps are not available for Pease AFB.

Surface relief in the area is minimal. The change in elevation from a given low point to the adjacent high is only 10 feet, and slopes are gentle. The highest elevations, approximately 60 feet above mean sea level (ft MSL), are on the aircraft parking apron. The aircraft parking apron is constructed of portland cement concrete, and the joints between the concrete slabs have been sealed. The aircraft parking apron is, therefore, relatively impermeable. The surface of the aircraft parking apron is graded such that most runoff is directed ... orm drain catch basins for eventual discharge to McIntyre Brook. McIn... e Brook flows f... he southwestern edge of the runway toward Great Bay. Snowfall on the aircraft parking ... on is cleared and banked on adjacent areas, including the area around Building 222. These snowbanks contribute meltwater to the site.

Building 222 is on a relative topographic high, and there is a localized drainage divide. Runoff from Building 222 and areas southwest of the divide flows toward the Test Cell Ditch. Runoff from the Building 222 parking lot and areas northwest of the divide flows toward a northern ditch (Upper Newfields Ditch), which runs parallel with, and approximately 400 feet northwest of, the Test Cell Ditch. A third drainage ditch, the Southern Ditch, which begins approximately 300 feet southeast of the Test Cell Ditch, joins the Test Cell Ditch at Dover Avenue. The Test Cell Ditch receives most of the surface runoff from the site (excluding the storm-drained areas of the aircraft parking apron). The Test Cell Ditch and the Southern Ditch discharge to the storm drain system under Dover Avenue for eventual discharge to Grafton Ditch. Flow in Upper Newfields Ditch flows under Dover Avenue near Building 119.

All three ditches intersect the water table and, hence, are discharge points for shallow groundwater. This is indicated by dry period flows in the ditches. During prolonged dry periods, the ditches may be dry for most of their lengths as the water table drops. Pumping the GWTP recovery wells affects flow in the Test Cell Ditch because the water table is lowered by pumping. In the past, the Test Cell Ditch received cooling and washdown waters discharged from the JETC. The JETC is no longer in use; however, prior to its being taken out of service, discharges of these waters were rerouted to two holding tanks that are periodically emptied for off-site disposal. Much of the runoff from other areas of the site either pools or infiltrates in the wetlands, and does not reach the drainage ditches as overland flow. There is little runoff from the wetlands; they are primarily an area of infiltration, evapotranspiration, and groundwater recharge. The wetlands are discussed in greater detail in Subsection 2.4.7 of the Draft Final Site 34 RI Report (F-499).

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Site Use and Response History

The JETC was constructed in the late 1960s and has been in operation from 1970 until closure of the facility in 1991. The JETC was used to test jet engines through complete power ranges. During an engine test, water was injected into the exhaust stack to reduce exhaust temperature, hydrocarbon emissions, and noise. A single test could use 3,000 gallons or more of water. Additional water and wastes (i.e., fuel, hydraulic fluid, and cleaning solvents) were generated during washdown activities in the test bay area. Liquids from the facility were routed through an oil/water separator and then discharged to the Test Cell Ditch. In 1989, modifications were made to eliminate wastewater discharged to the storm drain by collecting the water in two 3,000-gallon underground storage tanks (USTs). A UST for jet fuel (JP-4) was located on-site. A more detailed description of site history is presented in Sections 1 and 3 of the Draft Final Site 34 RI Report (F-499).

The JETC was first identified as an area of possible environmental concern in 1983 during the Installation Restoration Program (IRP), Phase I Problem Identification/Records Search (F-75). The purpose of that study was to identify and evaluate suspected problems associated with past practices at Pease AFB. Records show that releases from the JETC to surrounding soils occurred from the oil/water separator. Product was visually observed in an excavated septic tank trench near Building 222 during Phase I. Following the Phase I study, Phase II Site Investigations, Stages 1 through 3 were initiated under the IRP.

The Phase II, Stage 1 (September 1984 to January 1986) investigation consisted of completing two borings to the southeast of Building 222. One soil sample was collected from each boring for chemical analysis. The results of this investigation are reported in the Phase II, Stage 1 Confirmation/Quantification Final Report (F-44).

The Phase II, Stage 2 (October 1987) Site Investigation effort focused on further characterizing the extent of soil contamination and the effect of site activities on groundwater, surface water, and sediment. Stage 2 activities included a soil-gas survey; six soil borings; installation of one bedrock well; and soil, groundwater, surface water, and sediment sampling for laboratory analyses. The results of the Stage 2 investigation are reported in the Stage 2 Draft Final Report (F-455) and Interim Technical Report (ITR) No. 2 (F-453).

Based on the data generated during Stage 2, additional field investigations and Interim Remedial Measures (IRMs) were implemented as part of Stage 3. The 1990 Stage 3 field investigations included installing two bedrock wells, test pit investigations, and wetlands delineations. IRMs consisted of soil and sediment removal along the Test Cell Ditch and the design and installation of a pilot groundwater treatment plant (GWTP).

A pilot groundwater remediation system (GRS) was constructed as an IRM at Site 34 during 1990 to 1991. The goals of the GRS were to limit the migration of contaminants in groundwater, to remove contaminant mass from the subsurface, and to evaluate potential treatment technologies to be used in the final site remediation.

The GRS consists of a groundwater recovery system and a GWTP. The groundwater recovery system consists of two bedrock recovery wells located at the southeastern end of the source area in the dissolved contaminant plume. The average combined yield from the recovery wells is approximately 21 gallons per minute (gpm). Groundwater from the recovery wells is treated to remove iron, manganese, and dissolved organic contaminants. Treated groundwater is discharged to the base sanitary sewer system.

Unit processes used at the GWTP are flow equalization, greensand filtration, and activated carbon adsorption. During the first 17 months of operation, from March 1991 through July 1992, the GRS recovered and treated approximately 9.5 million gallons of groundwater.

The effluent from the GWTP consistently meets drinking water standards, the requirements agreed on by NHDES and the Air Force for discharge to the base sanitary sewer system. The plant has not presented any major operational difficulties.

The GRS has had more than adequate success in meeting its objectives: the groundwater recovery system has shown to be effective in capturing both overburden and bedrock water-bearing unit contaminants, and the GWTP unit processes have been effective in removing organic and inorganic constituents. Based on past operations, only minor modifications are recommended for continued operation of the Site 34 GRS during the interim period until final remedial activities are implemented.

Table 1 in Appendix A summarizes the Stage 2 and 3 field investigation activities. Based on the data collected from these IRP investigations, a Site Characterization Summary (SCS) (F-482) was prepared for the JETC. The SCS included a working conceptual model and presented data required to complete a Baseline Risk Assessment (BRA) and Feasibility Study (FS).

The data required to complete a BRA and FS were collected during the 1991 Stage 3 field investigation. The 1991 field investigations included installing 13 bedrock and 5 overburden wells and 19 piezometers; completing soil borings; and sampling and analysis of groundwater, soil, sediment, and surface water. A surface geophysical survey was also performed to provide information on bedrock topography and potential fractures in the JETC area.

In addition to these activities, several other actions have been taken to reduce the potential for environmental impacts resulting from JETC operations. These actions and their objectives include:

- Reconfiguration of the JETC drain system and installation of holding tanks to eliminate discharges of effluent from the exhaust stack area to the Test Cell Ditch.

- Plugging of floor drains in the Test Cell Bay to prevent contaminant discharges to the Test Cell Ditch. Fluids generated in the bay are collected with absorbent material and containerized for proper disposal.

- In-place abandonment of a heating oil tank suspected of leaking.

- Removal of the buried JP-4 tank and installation of an aboveground JP-4 tank equipped with appropriate spill containment.

B. Enforcement History

In 1976, the Department of Defense (DOD) devised a comprehensive IRP to assess and control migration of environmental contamination that may have resulted from past operations and disposal practices at DOD facilities. In response to the Resource Conservation and Recovery Act of 1976 (RCRA) and in anticipation of CERCLA, DOD issued a Defense Environmental Quality Program Policy Memorandum, dated June 1980 (DEQPPM 80-6), requiring identification of past hazardous waste disposal sites on DOD agency installations. The program was revised by DEQPPM 81-5 (11 December 1981), which reissued and amplified all previous directives and memoranda on the IRP.

Pease AFB was proposed to be added to the National Priorities List (NPL) in 1989 and was listed on the NPL in 1990. On 24 April 1991, the Air Force, U.S. Environmental Protection Agency (EPA), and New Hampshire Department of Environmental Services (NHDES) signed a Federal Facilities Agreement (FFA) establishing the protocol and timetable for conducting the Remedial Investigation/Feasibility Study (RI/FS) process at Pease AFB. As part of this timetable, the Air Force, in an effort to streamline activities, designed a basewide strategy plan for conducting an RI/FS. This strategy plan grouped the numerous sites into seven zones or operable units based on geographic location, potential receptors, and potential future uses. RI/FS reports will be prepared for each zone. However, prior to inclusion of Pease AFB on the NPL, some sites (including the JETC) were on an accelerated RI/FS approach because of the potential threat they posed to human health and the environment. The Air Force, EPA, and

NHDES agreed that the source area RI/FS reports, and the remedial actions at these five sites, would continue on an accelerated schedule toward source area cleanup.

III. COMMUNITY PARTICIPATION

Throughout the site's recent history, there has been community concern and involvement. EPA, NHDES, and the Air Force have kept the community and other interested parties apprised of site activities through informational meetings, fact sheets, press releases, and public meetings.

In January 1991, the Air Force released a community relations plan that outlined a program to address community concerns and keep citizens informed and involved during remedial activities. This plan is currently being updated and is scheduled for completion by summer 1993.

Numerous fact sheets have been released by the Air Force throughout the IRP at Pease AFB. These fact sheets are intended to keep the public and other concerned parties apprised of developments and milestones in the Pease AFB IRP. The fact sheets released to date that concern the JETC are summarized as follows:

Fact Sheet	Release Date
Pease AFB Installation Restoration Program Update	October 1991
Pease AFB Installation Restoration Program Update	December 1992
Underground Storage Tank Program Overview	January 1993
Interim Groundwater Treatment — Sites 8, 32/36, and 34	January 1993
Proposed Plan for Site 34 Source Area	March 1993

In addition to the fact sheets, a number of public meetings have been held concerning the remediation of Site 34. On 14 November 1991, an IRP update public meeting was held, and on 12 January 1993, an IRP p...lic workshop and meeting were conduc...d to provide the public with information on the status of the IRP at Pease AFB. On 30 ...ch 1993, the Air Force conducted a public hearing and information session for the JETC (Site 34) Proposed Plan, during which oral comments on the Proposed Plan were received. A transcript of oral comments re...ed duri... is meeting and the Air Force's response to comments are included in the attache... sponsiv...ss summary (see Appendix D). A full transcript is available in the Administrative Record file at Pease AFB. In addition, a public comment period for the Proposed Plan was conducted between 14 March and 14 April 1993. Responses to writte... comments received during this period are also included in Appendix D.

A complete In...rmation Repository containing documents relating to the Pease AFB IRP is maintained at Pease AFB in Building 43. An Administrative Record containing correspondence pertaining to the Pease AFB IRP is also located in Building 43 at Pease AFB. An index of the Administrative Record is maintained at EPA Region I Headquarters in Boston, Massachusetts.

IV. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The JETC (Site 34) is one of several contaminant s... ...ces within Zone 3. Zone 3 is a grouping of IRP sites and UST sites within the IS/PA area and is shown in Figure 1. The remedy presented in this Record of Decision (ROD) ...ovides for source control at the JETC. Remediation at a Superfund site typically involves activities to remove or isolate contaminant source materials in conjunction with activities that mitigate migration of contamination through groundwater and/or surface water pathways. This ROD addresses only source control measures at the JETC. Management of contamination in groundwater for Zone 3 (operable unit 3) will be addressed in separate zonewide documents, including a separate Zone 3 ROD.

S...rce mat... at the JETC have been iden... as source area soil and associa... USTs. Although se...ents in site drainage ditches ar... ...tlands areas may represent an additional source, they are not addressed in this document, but will be addressed as part of the Zone 3 remedial decision process. Groundwater and surface water are not considered source materials;

however, treatment goals were generated for these media, as they may be affected by source control activities.

The selected source control remedy was developed to reduce migration of contaminants from the source area soils to groundwater. In summary, the remedy provides:

- Excavation of contaminated soil from the JP-4 Tank Area, the Fuel Oil Tank/Waste Fuel Separator Area, the manhole area and holding tanks area, and transport to an approved off-site treatment/disposal facility.

- Dewatering of the site during soil excavation and treatment of the extracted groundwater at the existing on-site treatment facility, with subsequent discharge to the base sanitary sewer.

- Backfilling of the excavation with excavated soil not requiring treatment or clean fill.

- Environmental monitoring during remedial operations.

- Removal of USTs and drain piping from the manhole to the Test Cell Ditch.

The remedial action will address the objectives discussed in the following paragraphs.

The results of the BRA for Site 34 soils indicated that no significant adverse health effects on human receptors are expected. This includes exposure resulting from incidental ingestion of, or dermal contact with, contaminated soil. The results of the ecological risk assessment indicated that no significant adverse effects on ecological receptors resulting from site-related contamination are expected. However, the potential may exist for contaminants to leach from source area soils into groundwater, resulting in human ingestion of, or direct contact with, contaminated groundwater that may present a health risk.

In consideration of the aforementioned conditions, the remedial response objective for source control actions at the JETC is to minimize the leaching of contaminants from the source area soil into groundwater, thereby reducing the potential for the public to ingest or directly contact contaminated groundwater that may present a health risk.

The remedy at the JETC is for contaminant source control only. The intention for this remedy is to limit contaminant leaching from soils to groundwater. Owing to the complexity of groundwater flow in the vicinity of the JETC and the priority of other sites and groundwater contaminant plumes, groundwater issues will be better evaluated on a *zonewide* or operable unit basis, rather than a site-specific basis. This site was targeted for source control because it was considered an area of high contamination and remedial activities for source control could be started prior to completion of the full groundwater evaluation.

V. SUMMARY OF SITE CHARACTERISTICS

Section 1 of the Draft Final Site 34 FS Report (F-504) contains an overview of the RI activities conducted at the JETC, and Table 1 in Appendix A of this document presents a summary of RI activities conducted at Site 34. The significant findings of the RI are presented in this subsection.

A. Site Geology

The bedrock in the vicinity of the JETC (Building 222) has been identified from samples obtained from a total of 26 locations as split-spoon samples, well cuttings, and cores. The identified rock types consist of quartzite, felsite, and diabase. The rock types have been tentatively classified as belonging to the Kittery Formation, the Exeter diorite, and the diabase dikes of the White Mountain Series.

The bedrock surface beneath the JETC is irregular, probably as a result of preglacial preferential erosion. Overall, the bedrock ranges from highs of 0 ft BGS (outcrop approximately 15 feet northeast of Building 222) to lows of greater than 45 ft BGS. A bedrock high located under Building 222 is bordered on the east and west by steep-sided, broad valleys. Another bedrock high exists east-northeast of Building 222.

The upper few inches to approximately 1 foot of thickness of bedrock at the JETC was found to be weathered and highly fractured, based on cores collected from eight boreholes. The weathered and/or fractured bedrock is probably transmissive and grades downward into a more competent bedrock. A well-sorted gravel that overlies the bedrock ranges from a few inches to more than 1 foot in thickness. The gravel unit usually consists of angular bedrock fragments and was field-identified with the overlying till unit. This suggests that the weathered/fractured zone is widely distributed around the bedrock high located under Building 222.

At the JETC, the locations of fractures were determined by use of the very low-frequency electromagnetic method. Bedrock lineaments at the JETC consist of a set of eight lineaments that trend approximately N42°E to N54°E. A second set of four lineaments occurs that trends N11°W to N18°W. Two other lineaments that occur at the JETC have orientations that trend N80°E and N24°W. The lineaments that trend approximately northeast-southwest probably are related to the regional strike of the bedrock, while lineaments oriented to the northwest-southeast are probably related to cross fractures or faults in the bedrock.

The lineaments of greatest potential concern for contaminant and water migration near Building 222 are the five lineaments that surround the Building 222 bedrock high. The set of lineaments that trends approximately N45° E may represent fractures, faults, or preglacial drainageways. These lineaments may be paths of least resistance for water migration under and away from Building 222.

In addition to the descriptions of the natural fractures, the rock quality determination (RQD) of the core was determined. The RQD of a core is equal to the sum of the length of the core pieces separated by natural fractures that are greater than 4 inches long, divided by the length of cored interval (expressed as a percentage). At the JETC, the RQD values indicate that portions of the bedrock are highly fractured, which is indicative of higher potential for groundwater movement through the rock type.

The unconsolidated overburden, except for the weathered bedrock and manmade fill, at Pease AFB appears to correlate with the Wisconsinan age glacial episode. Based on present and historic drilling information at Pease AFB, the stratigraphic units are divided into four units as follows (in descending order from youngest to oldest):

- Upper Sand (US).
- Marine Clay and Silt (MCS).
- Lower Sand (LS).
- Glacial Till (GT).

Each of these units is present at the JETC. The nature and distribution of these overburden units have contributed to the distribution and migration of contaminants into the surrounding area.

The uppermost surficial materials observed at the JETC are Recent swamp (i.e., bog or marsh) deposits. These deposits are especially common over the MCS unit, and accumulate in the poorly drained areas only. The thickness of the swamp or peat deposits varies between 1 foot and 2 feet. Locally, these low-lying surficial units have been modified by the Air Force using draining or cut-and-fill practices.

Also present at the surface [illegible] the JETC are fill materials. The fill material varies from an unconsolidated, tan, fine- to medium-grained sand near the underground storage tanks (USTs) to a highly compacted, reddish brown fill under the flight apron. Unconsolidated sand fill near the USTs and the leaching field pipes ranged in thickness from 6 to 8 ft BGS; in places it was present from the ground surface to bedrock.

The youngest glacial overburden unit at the JETC is the US. In places, the US is difficult to distinguish from the fill, or where the MCS unit is absent from the LS. The US consists of poorly sorted sand with some silt and gravel at the JETC. At many locations in the vicinity of the JETC, the US has been replaced by fill, especially near the USTs and the flight apron.

Stratigraphically underlying [illegible] US is the M[illegible] The MCS ranges in thickness from 0 to 22 feet and varies in texture fr[illegible] dark gray, plastic clay with minor very thin interbeds of silty material to well-laminated, [illegible]bedded, fine sa[illegible]ts, and clays. The dark gray, plastic clay and elastic silt is defined as a mappable unit at the JETC as one progresses away from the bedrock high toward bedrock lows. The MCS unit grades into an interbedded fine sand and silt unit near the bedrock high. At the site, contacts between the MCS, US, and LS are gradational.

The LS at the JETC consists of a poorly sorted, silty sand, with some medium gravel and sand. The LS was absent only in the vicinity of the bedrock high, near Building 222, where, in the absence of the MCS, granular deposits were considered part of the US unit.

The GT was found on-site as a more loosely compacted till located near bedrock lows. At some locations, an interval of well-sorted gravel underlies the GT and was sometimes field-identified as weathered bedrock.

B. Site Hydrogeology

The three hydrogeologic units that have been identified and evaluated for the JETC area are as follows:

- Overburden — The saturated overburden deposits, including artificial fill, but not the basal glacial till.
- Shallow Bedrock and Glacial Till — The highly weathered and/or fractured interval of crystalline rock that extends from the base of the lower glacial sand to the top of the competent bedrock. Its thickness is typically 10 to 20 feet.
- Deep Bedrock — Generally competent bedrock beneath the shallow bedrock. Groundwater flow is primarily in unweathered fractures.

Hydraulic tests and water level data indicate that the hydrogeologic units in the JETC area are hydraulically connected, even though each unit has distinct hydrologic properties. The degree of interconnection at any locality depends on the specific lithology of the overburden, the degree of fracturing and weathering, and the location and amount of groundwater pumping. In the JETC area, under natural conditions, groundwater discharge from all hydrogeologic units is to surface streams.

C. Site Source Area General Characteristics

Soil contamination is present in four distinct areas at the JETC: the JP-4 Tank Area, the Fuel Oil Tank/Waste Fuel Separator Area, the manhole area, and the holding (septic) tanks area (see Figure 3). This subsection summarizes the contaminants found in these source areas (i.e., area of soil contamination). Additional information regarding the nature and extent of soil contaminants is presented in Subsection 1.5.1 of the Draft Final Site 34 FS Report (F-504).

Organic contaminants present in soil at the site consist of three groups of compounds: aromatic VOCs, chlorinated VOCs, and PAHs (SVOCs). One or more of these groups have been detected in surface (0 to 2 ft BGS) soil samples and subsurface (greater than 2 ft BGS) soil samples to a maximum depth of 13 ft BGS.

Metals concentrations in subsurface soil present above established background levels coincide with areas of organic contamination and are interpreted as additives in JP-4 fuel and fuel (heating) oil used at the JETC. Principally arsenic, chromium, nickel, and sodium are present in areas of hydrocarbon contamination at concentrations above established background levels. Barium and lead concentrations present in surface soil above background levels are not associated with the JETC source area or JETC activities.

The highest levels of organic contamination detected in subsurface soils were in the JP-4 Tank Area. The JP-4 Tank Area is located east of the JETC. Contaminants found in soil in the JP-4 Tank Area consist primarily of aromatic VOCs and PAHs. JP-4 was also identified by FID fingerprint analyses. No incidences of spills or other releases from the JP-4 tank have been reported since its installation in 1970. However, based on the distribution and levels of organic compounds present in soil samples collected adjacent to the tank, the JP-4 tank is the most likely source of the soil contamination in this area. In October 1991, the JP-4 tank was emptied to avert any future potential releases. In addition, contaminants detected along the southeastern edge of the JP-4 Tank Area may be attributable to contaminants that were processed through the leaching field.

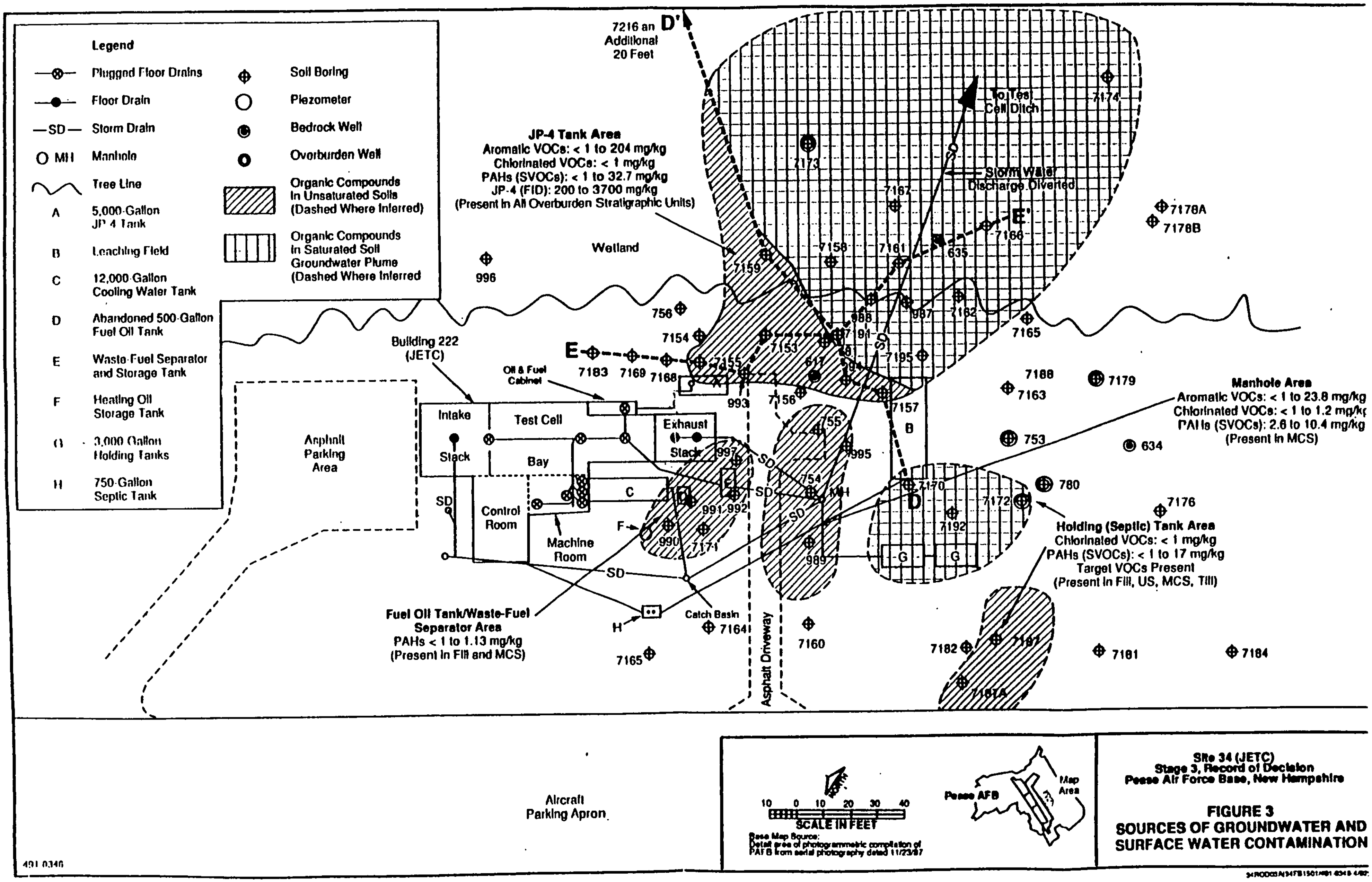


FIGURE 3
SOURCES OF GROUNDWATER AND SURFACE WATER CONTAMINATION

Figures 4 and 5 are stratigraphic cross sections that show a schematic representation of the distribution of soil contamination for the JP-4 Tank Area, and the relationship between the soil contamination and the groundwater flow system. These figures illustrate that the migration of contaminants in soil is controlled primarily by the slope of the bedrock surface. PAHs are the only organic compounds detected in the Fuel Oil Tank/Waste Fuel Separator Area, which is located adjacent to the southern corner of the JETC. Relatively low (<2 mg/kg) levels of PAHs were found in fill material at sample depths of 4 and 6 ft BGS, and in the MCS unit at a sample depth interval of 4 ft BGS. Since PAHs are common constituents of heating oils, the most likely source of the low levels of PAHs in soil is the abandoned steel heating oil tank. Another possible source of the PAH contamination is the waste fuel separator. JP-4-contaminated effluent from the JETC may have been released to the soil through breaches in the separator.

Effluent received by the waste fuel separator was normally a mixture of hydraulic fluids, degreasing solvents, JP-4, and emulsifiers. The emulsifiers were used to enhance the solubility of the petroleum-based products that accumulate on the floor of the JETC. Both the heating oil tank and the waste fuel separator were installed in the late 1960s, during JETC construction. Since the heating oil tank was abandoned in 1987 and the waste fuel separator has not been in use since mid-1990, they are no longer a source of soil contamination at the JETC.

Soil contamination in the manhole area was detected only in the MCS unit and consisted of PAHs and aromatic and chlorinated VOCs. The primary contributor to total PAH levels in the manhole area is naphthalene. Aromatic VOCs present in the manhole area consist primarily of BTEX compounds. The primary contributors to the total chlorinated VOCs are 1,1,1-trichloroethane and chlorobenzene. The probable sources of these contaminants are spent solvents used in post-test engine cleaning at the JETC. Washdown liquid containing solvents collected in the test cell floor drains may have been released through breaches in the drainage pipe leading to the stormwater manhole or the waste fuel separator. In addition, contaminants that have accumulated in the manhole area may be migrating to the east, toward the Test Cell Ditch, along the backfilled trench that was completed for drain pipe installation.

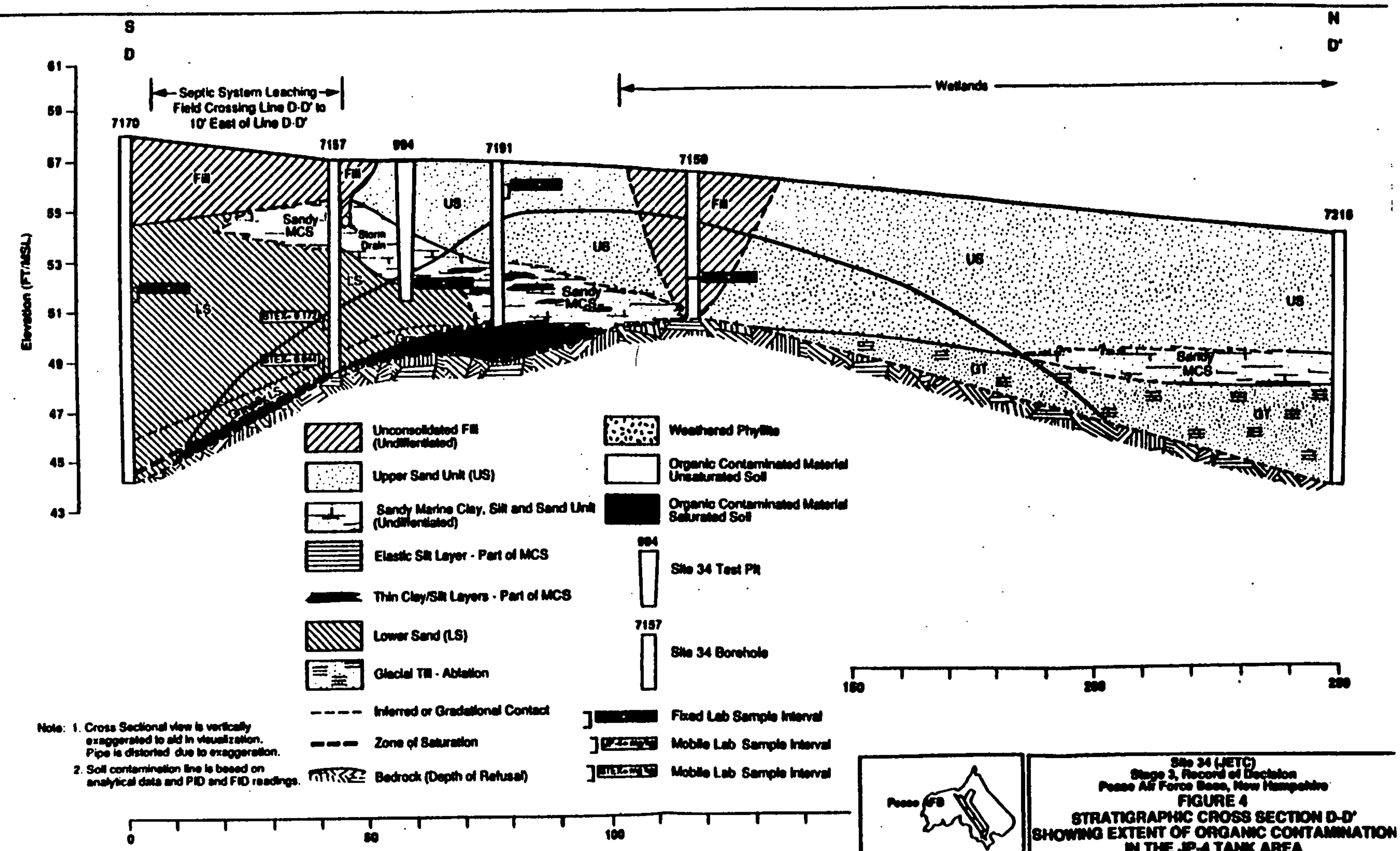


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FIGURE 4
STRATIGRAPHIC CROSS SECTION D-D' SHOWING EXTENT OF ORGANIC CONTAMINATION IN THE JP-4 TANK AREA

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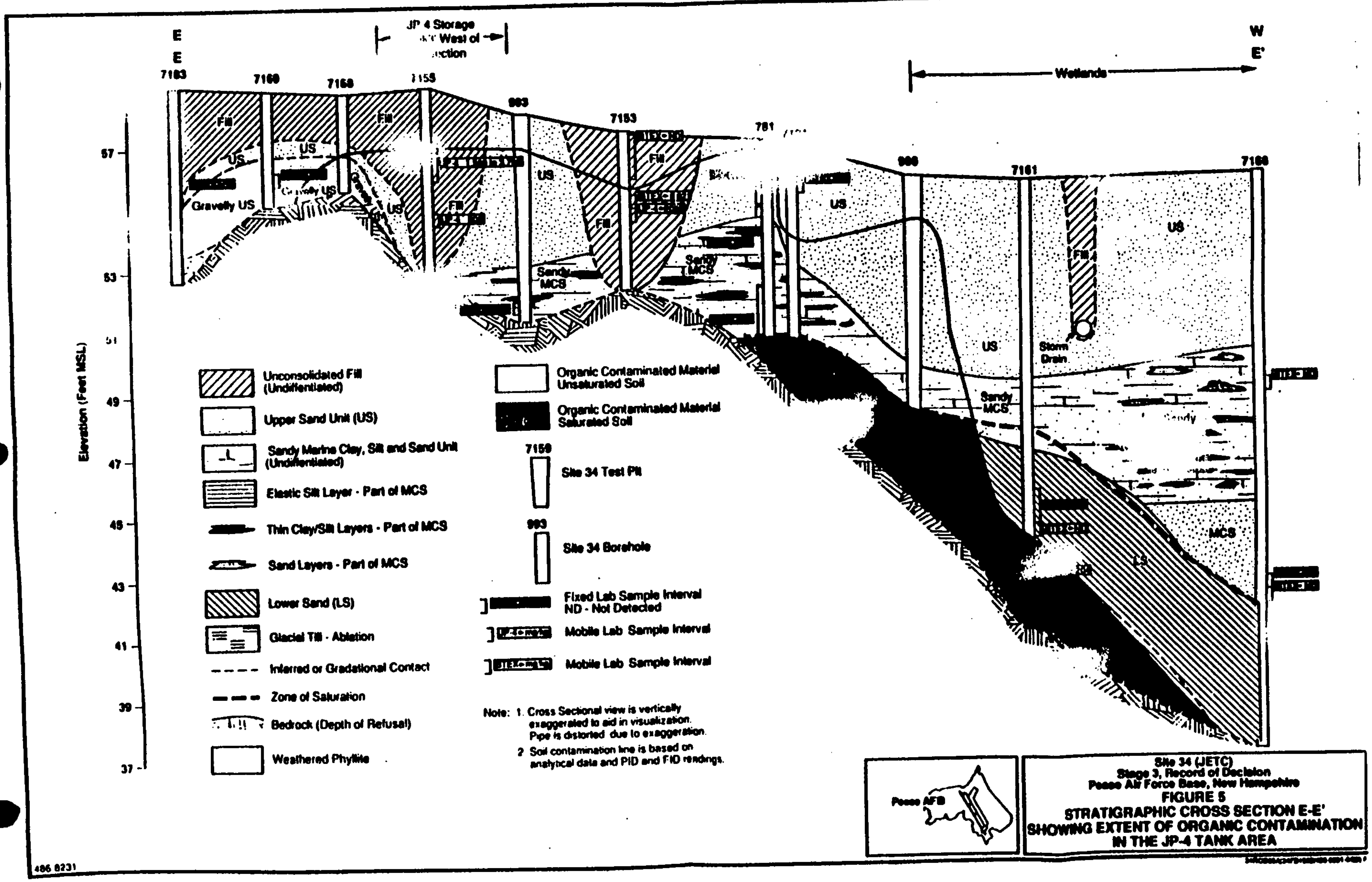

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FIGURE 5
STRATIGRAPHIC CROSS SECTION E-E' SHOWING EXTENT OF ORGANIC CONTAMINATION IN THE JP-4 TANK AREA

Soil contamination in the holding tanks area consisted primarily of PAHs and was present only in saturated soil samples (i.e., at the top of the shallow water table). In addition, FID analysis reported target VOCs also present in this area. No identification or quantification of VOCs was reported. Contamination in this area was evident prior to December 1989. Petroleum contamination in saturated soil and groundwater was obvious during holding tank installation. A potential source of soil contamination in this area is contaminated effluent from the manhole area.

Contaminant Mobility

The fate and transport of contaminants within a soil matrix are dependent on the chemical properties of the contaminants, soil types, stratigraphy, and climatic conditions. Contaminant fate and migration are further controlled by transport and attenuation processes. Important transport processes include surface water and groundwater movement, leaching, and erosion. Attenuation processes include retardation resulting from sorption, volatilization, photo-oxidation, photolysis, and chemical and biological degradation.

The major contaminants found at the JETC are components of JP-4 and fuel oil. Significant components of JP-4 include benzene, toluene, ethylbenzene, xylenes, and other complex aromatic hydrocarbons, such as isopropylbenzene. Naphthalene and phenol compounds are also present. Fuel oil contains many of the same compounds as JP-4 and is predominantly a mixture of straight-chain hydrocarbons, aromatic hydrocarbons (including trimethyl-benzenes), and some PAHs. Fuel oil also may include some additives, which may contain phenols, naphthalenes, and heavy metals, such as nickel, chromium, vanadium, zinc, and arsenic (F-299).

The fate of JP-4 in the soil environment is a function of the solubility, volatility, sorption, and degradation of its major components. Because of their high volatility, moderate solubility, and moderate adsorption to soils, the major components of JP-4 and fuel oil are relatively mobile and nonpersistent in soil systems. For JP-4 released to surface soils, volatilization to the atmosphere is the primary fate for most of the JP-4 hydrocarbons (F-299). In cases in which the source of contamination is leaks from USTs, the volatile components do not have an opportunity to evaporate before penetrating the soil, and can possibly enter the water table. Biodegradation of the petroleum hydrocarbons comprising JP-4 fuel is expected to be rapid under conditions favorable to microbial activity, especially in an initially aerobic environment (F-299). Because of lower levels of oxygen and organic carbon, contaminant persistence in deep soils and groundwater may be greater than in shallow soils. Benzene is the most mobile and soluble of the aromatic hydrocarbons, and that portion that does not volatilize, sorb, or degrade will [illegible] into the groundwater. The other aromatic hydrocarbons are less mobile and may be [illegible] the soil and groundwater.

The PAH compounds, except for the naphthalenes, are strongly sorbed to soils and are slightly mobile to immobile and, therefore, tend to persist in the soil until they are degraded. Thus, these compounds are not likely to be found in the groundwater.

D. Groundwater

Soil at Site 34 is a concern because of the potential for leaching of organic contaminants to groundwater and surface water. Groundwater characteristics are presented as a background for source control activities. A remedy for groundwater will be discussed in the Zone 3 RI and FS Reports.

Site Groundwater General Characteristics

Physiochemical Considerations

Many of the contaminants detected in soil and sediment were also detected in groundwater. These contaminants (mostly aromatic hydrocarbons and naphthalene) have relatively low to moderate mobility and are stable. Contaminants detected in groundwater and not detected or detected at low concentrations in soil or sediment are normally compounds that are highly mobile, such as TCE and DCE, and may have been leached from the soil or migrated from outside the JETC area.

JP-4 tends to infiltrate into porous, sandy soils, and since it is lighter than water it tends to accumulate at the soil-groundwater interface. There, the more soluble components dissolve into the groundwater and migrate with the groundwater at a rate determined by their retardation factors until they degrade or are discharged to the surface. In cases in which sufficient amounts of JP-4 have been spilled, a separate light, nonaqueous-phase liquid (LNAPL) may form on the surface of the water table. To date, free-phase product has been observed at only one groundwater monitoring point (piezometer 753) during two rounds of water level measurements (January and April 1989).

Relatively low levels of chlorinated VOCs, such as TCE and DCE, have been detected in groundwater samples. These compounds have specific gravities greater than water and may exist as dense, nonaqueous-phase liquids (DNAPLs). However, the fact that the concentrations of these compounds in the groundwater are well below their aqueous solubilities, and the probability that the principal sources of chlorinated VOCs originate outside of the JETC area, suggests that separate dense phases are not likely to exist in groundwater at the JETC.

Conceptual Site Model of Migration Pathways

Based on hydraulic tests and water level data, the deep bedrock, shallow bedrock, and overburden water-bearing units in the JETC area are hydraulically connected. Although each water-bearing unit has distinct hydrologic properties, there is communication among units. The interaction of the three water-bearing units is due to three site conditions: fracturing and subsequent weathering of the bedrock, overburden deposition, and excavation activities.

Field data that support the premise that the three water-bearing units are in communication include: (1) the partial dewatering of the overburden and the shallow bedrock water-bearing units observed when groundwater is pumped from the two bedrock groundwater recovery wells (634 and 635); (2) the lack of clay and silt and the presence of porous fill in direct contact with bedrock observed in soil borings and test pits; and (3) the similarities in the organic chemical composition between groundwater sampled from the deep bedrock water-bearing unit and soil sampled from characterization borings.

The migration of contaminants from the unsaturated overburden soils to the shallow groundwater flow zone is enhanced by recharge of stormwater. Water level data do not indicate that groundwater in the JETC area has a specific recharge point or area. In addition, groundwater recharge should be significant in backfilled areas associated with JETC construction and subsequent site modifications (i.e., holding tanks and leaching field installations). Geotechnical analysis of two fill samples collected at the JETC reported porosities of 29% and 40%. Consequently, these fill areas would rapidly absorb stormwater and provide a vertical conduit for groundwater recharge. Furthermore, Building 222 is situated over a bedrock high (bedrock outcrops just east of the building), and much of the adjacent fill areas are relatively thin and unsaturated. Groundwater recharge in these areas is directly into the shallow bedrock water-bearing unit.

With the exception of arsenic, the distribution of metals in groundwater in the JETC area is not apparently the result of the leaching of metals in source area soils. This premise will be further evaluated and discussed in the Zone 3 FS Report.

Groundwater discharge to surface water bodies within and adjacent to the site is considered an important contaminant migration pathway in the JETC area. The hydraulic gradient in the overburden water-bearing unit indicates that groundwater, in general, flows eastward from the source area and is captured by the Test Cell Ditch and other topographically low areas within the wetlands.

The Test Cell, Upper Newfields, and Southern Ditches may receive contaminants through discharges from the overburden groundwater flow zone, from stormwater runoff, or from storm drain discharges (Test Cell Ditch only).

Based on the location of the JETC source areas, the overburden groundwater gradient, and stormwater drainage, the Test Cell Ditch is the only plausible surface water pathway for the migration of contaminants originating from the JETC source areas. Since the completion of the sediment/soil removal IRM and the reconfiguration of the JETC drainage system, contaminated effluent is no longer a contributor to surface water or sediment contamination in the Test Cell Ditch.

Contaminant levels in the overburden groundwater flow zone are relatively low; groundwater sampled from well 5016 had a detected total VOC concentration of 3.4 μg/L. Therefore, groundwater discharging into the Test Cell Ditch also would have relatively low VOC concentrations, and may be further diluted from stormwater runoff captured by the ditch. This is substantiated by trace levels (3.2 μg/L) of total VOCs found in the surface water at staff gage 806.

Groundwater contamination will be more fully evaluated in the Zone 3 RI and FS Reports and will be discussed in the rest of this document only with regard to actual source control issues.

E. Surface Water/Sediment

Surface water and sediment were not evaluated in the Draft Final Site 34 FS Report. The sediment and surface water are currently under evaluation in the Zone 3 FS Report, which will include the groundwater, sediment, and surface water at the JETC. The delineated wetlands for Site 34 and Zone 3 are presented in Figure 6.

A complete discussion of the nature and extent of contamination and contaminant fate and transport is presented in Sections 4 and 5 of the Draft Final Site 34 RI Report.

VI. SUMMARY OF SITE RISKS

A. Human Health Risk Assessment

A BRA was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the site. The public health risk assessment followed a four-step process: (1) contaminant identification, which identified those hazardous substances that, given the specific site conditions, 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 magnitudes of adverse hea effects assc...ed with ex- e to hazardous substances; and (4) risk characterization, which integrated the three ear..er steps to summari he potential and actual risks posed by hazardous substances at the site, including carcinoge... and noncarcinogen... risks. The results of the human health and ecological risk assessments for the JETC are discussed in this subsection and the following subsection, respectively.

The BRA for this site is limited to the source areas evaluated in th 34 RI and FS Reports. Nineteen co minants of concern were selected for 0 to 2 ft B and ... contaminants of concern were selected for 0 to 15 ft BGS soils. The contaminants of concern constitute a representative subset of the more than 21 and 37 contaminants identified at the site for 0 to 2 and 0 to 15 ft BGS soils, respectively, during the RI. The contaminants of concern were selected to represent potential site-related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment. The contaminants of concern are listed in Tables 2 and 3 in Appendix A. A summary of ealth effects of each of the contaminants of concern is presented in Section 6 of the Dra al Site 34 RI Report.

Potential human health effects associated with exposure to the contaminants of concern were nated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These 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 site is intermittently used for industrial purposes, and future land use is assumed to be industrial. This umption is based on e current plans of the Pease Development Authority (PDA) to attract industrial tenants to the base as a means of boosting the local economy, because the local economy was adversely impacted by the base closure.

Of the three potential receptors (building workers, maintenance workers, and trespassers) for the soil pathway, the maintenance worker was selected as the most reasonable maximally posed individual (RME) under urrent a ure potential land use. The risk from exposure to surface (0- to 2-foot-deep) soils was ated for the current and future maintenance worker, and the risk from exposure to surface and subsurface (0- to 15-foot-deep) soils was

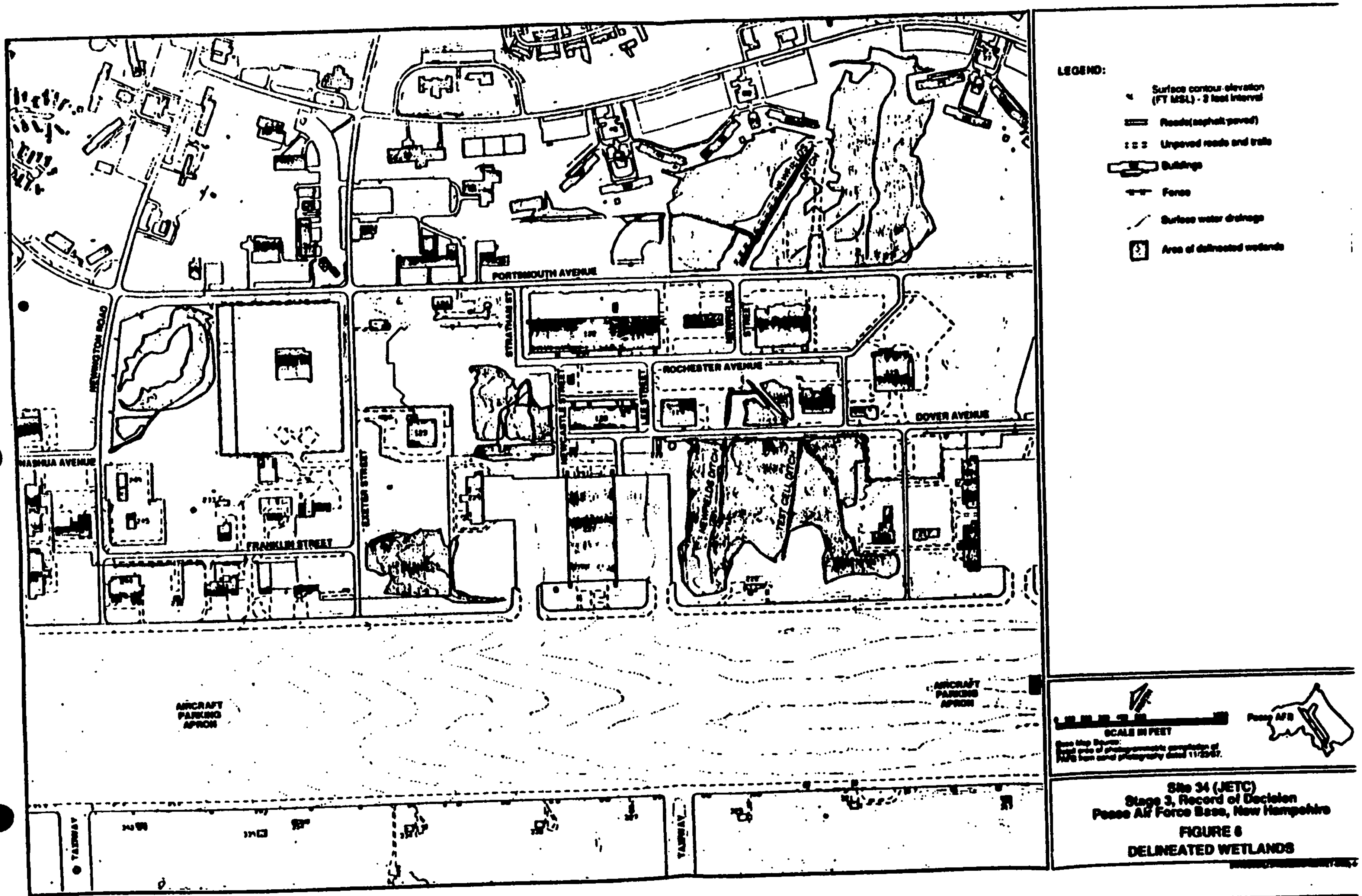

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FIGURE 6
DELINEATED WETLANDS

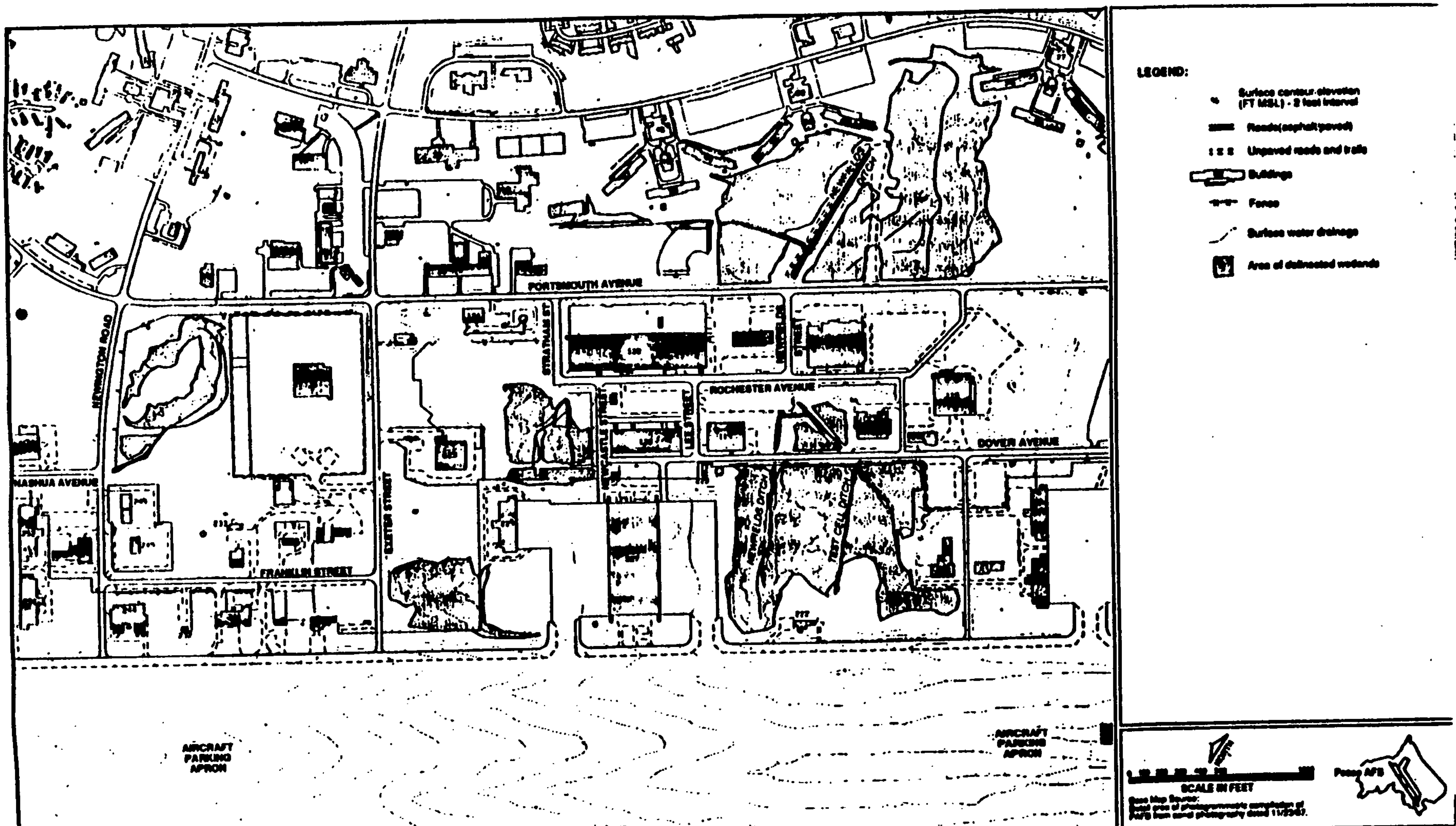

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FIGURE 6
DELINEATED WETLANDS

evaluated for the future maintenance worker. The exposure routes that were evaluated for the soil pathway were incidental soil ingestion and dermal contact with soil.

The following is a brief summary of the exposure pathways evaluated. A more thorough description is presented in Section 6 of the Draft Final Site 34 RI Report. For each pathway evaluated, an average and a reasonable maximum exposure estimate were generated corresponding to exposure to the average and the maximum concentration detected in that particular medium.

Currently, the JETC is not being used; however, it is expected that it will resume an industrial use soon, and that the future use of this area will be industrial. The current use receptor chosen as the RME for the soil pathway was the maintenance worker. The current maintenance worker exposure was assumed to be 2 hours/day, 1 day/week, 50 weeks/year, for 25 years. The maintenance worker was also chosen as the future RME for the soil pathway; however, the exposure frequency is greater because the site will be more active in the future. The future maintenance worker is projected to be potentially exposed for 2 hours/day, 250 days/year, for 25 years.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the lifetime averaged dose by the chemical-specific cancer slope factor. Cancer slope factors have been developed by EPA from epidemiological or animal studies to reflect a conservative *upper bound* of risk posed by potentially carcinogenic compounds (i.e., the actual risk is unknown, but is likely to be lower than the calculated risk). 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 that a 1-in-1-million chance of developing cancer over 70 years as a result of site-related exposure, as defined, to the compound at the stated concentration. Current EPA 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 noncancer health effects. A hazard quotient is calculated by dividing the exposure duration-averaged dose by the reference dose (RfD) or other suitable benchmark for noncancer health effects for an individual compound. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and to reflect a daily exposure level that is not likely to present 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 indicating the ratio of the stated exposure, as defined, to the reference dose value. 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. (For example: the hazard quotient for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage).

Table 4 in Appendix A depicts both the cancer and/or noncancer risk summary for the contaminants of concern in soil evaluated for the JETC to reflect present and potential future exposure pathways corresponding to the average and the reasonable maximum exposure scenarios.

From the summary table, it may be noted that the cumulative cancer risk falls within the EPA-acceptable risk range of 10^{-4} to 10^{-6}. A majority of the contaminants of concern do not result in an individual risk greater than 10^{-6}. Of the several contaminants whose risks do exceed 10^{-6}, most do not exceed a risk of approximately 10^{-5}. A more complete discussion of the risks associated with Site 34 is presented in Section 6 of the Draft Final Site 34 RI Report. The hazard indices for soil were all below the EPA criterion of 1.

Because the human health risk due to receptor contact with contaminated soils does not exceed the EPA acceptable risk range, remediation at Site 34 is instead based on the potential of soil contaminants to leach to groundwater and contribute to unacceptable human health risks through the groundwater exposure pathways. At this time of the Draft Final Site 34 FS (F-504), the groundwater risk assessment for Zone 3 (including Site 34) was not complete. However, as of the writing of this ROD, the Draft RI for Zone 3 (F-546) has been completed, and the risk assessment indicates that the human health risks through groundwater exposure pathways at Site 34 exceed acceptable levels.

B. Ecological Risk Assessment

Because ecological receptors are not likely to regularly come in contact with deep soils, the potential risks to ecological receptors at the JETC were evaluated for surface soils (0 to 2 ft BGS) only. The ecological receptors selected to evaluate potential environmental risks (i.e., the short-tailed shrew and the American robin) were chosen because they are representative of the extensive small mammal and ground-foraging avian communities normally found in this habitat type, shrew and robin exposure includes potential bioaccumulation of contaminants identified in surface soil and their transfer across trophic levels, and adequate data exist to determine the likelihood of impact. Short-tailed shrew and American robin exposure routes evaluated in the ecological risk assessment were incidental soil ingestion and ingestion of earthworms.

The potential risks to the short-tailed shrew and American robin were assessed by comparing estimated daily doses with Critical Toxicity Values (CTVs). Hazard quotients were calculated, for each contaminant, by dividing the estimated daily intake by the CTV. Hazard quotients were summed across all exposure pathways for each contaminant to develop specific hazard indices. Contaminant-specific hazard indices (average and maximum concentrations) were then added to provide cumulative hazard indices for the shrew and robin. A hazard index of greater than 1 is usually considered the benchmark for concern.

Hazard indices for the short-tailed shrew and American robin are presented in Tables 1.8-1 and 1.8-2 of the Draft Final Site 34 FS Report. The cumulative hazard indices for the shrew ranged from 305 to 951; the primary contributors to these indices were lead and barium intake via the invertebrate (earthworm) ingestion pathway. Neither the average nor the maximum cumulative hazard index for the robin exceeded 1. Concern over the uncertainty associated with the exposure results was expressed in the conclusions of the Draft Final Site 34 RI Report. The main concern was related to the impact of anthropogenic contamination that is not site-related on the outcome of the ecological assessment. Inorganic contaminants s as lead and barium were detected at the highest concentrations in areas adjacent to the vehi parking area and may be more related to normal airfield operation and general industrial use at the base rather than to site-related activities. When the incremental hazards from these suspected anthropogenic contaminants (lead and barium) are subtracted from the total hazard indices, risks from JETC-related activities approach EPA's target range. Therefore, the ecological receptors at the JETC site were not found to be at risk as a result of site-related contamination.

VII. DEVELOPMENT AND SCREENING OF ALTERNATIVES

A. Statutory Requirements/Response Objectives

Under its legal author es, the le agency's (i.e., Air Force) primary responsibility at NPL and imilar sites is to u take remedial actions that are protective of uman health and the environment. In addition, Section 121 of CERCLA establishes several statutory requirements and preferences, including that remedial actions must be protective of human health and the environment; the remedial action, when complete, must comply with all federal and state environmental standards, requirements, criteria, or limitations, unless a waiver is invoked; the remedial action selected must be cost effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and a preference for treatment remedies that permanently and significantly reduce the toxicity, mobility, or volume (TMV) of the hazardous substances is a principal element for selection over remedies not involving such treatment. Response alternatives for addressing JETC source areas were developed to be consistent with these Congressional mandates.

Based on preliminary information relating to types of contaminants, environmental media of concern, and potential exposure pathways, remedial action objectives were developed to aid in the development and screening of alternatives. These remedial action objectives were developed to mitigate existing and future potential threats to public health and the environment.

The remedial response objective for source control actions at the JETC was to minimize leaching of contaminants from the source area soils into groundwater or surface water, thereby reducing the potential for the public to ingest or directly contact contaminated groundwater or surface water that presents a health risk (cumulative cancer risk greater than 10^{-4}, or a hazard index greater than 1 for each contaminant of concern). Any further reduction in risk through soil exposure pathways would be a benefit; however, risks from direct contact with, or ingestion of, source area soils do not exceed the aforementioned criteria and, as such, remediation based on risk due to site soils is not required. However, as discussed previously, the Draft Zone 3 risk assessment indicates that groundwater at Site 34 does exceed acceptable risk levels and as such source actions at Site 34 are expected to reduce groundwater levels.

B. Technology and Alternative Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements, a range of alternatives was developed for the site.

With respect to source control, the FS developed a range of alternatives in which treatment that reduces the TMV of hazardous substances is a principal element. This range included an alternative that removes or destroys hazardous substances to the maximum extent feasible, thus eliminating or minimizing to the degree possible the need for long-term management. This range also included alternatives that treat the principal threats posed by the site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed, alternatives that involve little or no treatment but provide protection through engineering or institutional controls, and a no action alternative.

In Section 3 of the Draft Final Site 34 FS Report, technologies were identified, assessed, and screened based on implementability, effectiveness, and cost. These technologies were placed in the categories identified in Section 300.430(e)(3) of the NCP. Section 4 of the Site 34 FS Report presented the remedial alternatives developed by combining the technologies. The purpose of the initial screening was to reduce the number of potential remedial actions for further detailed analysis while preserving a range of options. Each alternative was then evaluated in detail in Section 5 of the Site 34 FS Report.

In summary, of the eight source control remedial alternatives screened in Section 4 of the Site 34 FS Report, five were retained for deta ed analysis. The following table identifies the five alternatives that were retained through the screening process:

Alternative No.	Description
1	No action (including monitoring).
2A	In situ soil aerobic biological treatment with soil vapor extraction, and on-site groundwater extraction and treatment with on- and off-site groundwater disposal.
3A	Excavation of contaminated soil; on-site ex situ solid-phase biological/vapor extraction treatment of contaminated soil; on-site dis osal of treated soil; gro dwater pumping and treating for ex vation de vatering; an ated groundwater discharge to sanitary sewer.
4	Excavation of contaminated soil; thermal desorption of contaminated soil; on-site disposal of treated soil; pumping and treating of groundwater for excavation dewatering; and treated groundwater discharge to sanitary sewer.
5A	Excavation of contaminated soil; off-site treatment/disposal of contaminated soil; backfilling of excavation with clean fill; groundwater pumping and treating for excavation dewatering; and disposal of treated groundwater to sanitary sewer.

III. DESCRIPTION OF ALTERNATIVES

This subsection provides a narrative summary of each alternative evaluated. A detailed tabular assessment of each altern ive is presented in Tables 5.2-1 through 5.2-5 of the Site 34 FS Report.

A. Source Control Alternatives Analyzed

The source control alternatives evaluated for the JETC were a no-action alternati (Alternative 1) and four alternatives involving treatment (Alternatives 2A, 3A, 4, and 5A).

Alternative 1 — No Action

The no-action alternative was evaluated in detail in the Site 34 FS Report to serve as a baseline for comparison with the other remedial alternatives under consideration. Under this alternative, no treatment or containment of source areas would occur. This alternative does include deed restrictions for the property and a long-term soil monitoring program. The GWTP currently operating at the site would continue to operate until the zonewide groundwater issues are addressed in the Zone 3 RI/FS. This alternative would not meet the cleanup objectives for this site.

Estimated time for design and construction: None.
Estimated time for operation: 30 years.
Estimated capital cost: $8,300.
Estimated O&M (present-worth): $358,700.
Estimated total cost (present-worth): $367,000.

Alternative 2A — In Situ Biological/SVE Treatment

This alternative involves the use of an in situ treatment system that would consist of aerobic biological treatment and soil vapor extraction (SVE) as a means of providing oxygen to the subsurface. The components of this alternative are as follows:

- Removal of remaining USTs and associated piping at the site.
- Groundwater extraction at a rate of 80 gpm to dewater the overburden to enhance SVE and aerobic biological treatment.
- SVE and gaseous-phase carbon treatment of the collected vapors.
- On-site treatment via chemical precipitation, multimedia filtration, and carbon adsorption of extracted groundwater prior to process use or discharge.
- Nutrient addition to a fraction of the treated groundwater and reinjection of the nutrient-rich mixture to stimulate the natural aerobic microorganisms for biological degradation of organic contaminants.
- Discharge of excess treated groundwater to the sanitary sewer and/or storm drainage system.

- Environmental monitoring to evaluate the effectiveness of the remedial action during the remedial process that consists of vapor sampling and analysis and, after completion of the remedial action, consists of soil sampling and analysis.

Estimated time for design and construction: 18 months.
Estimated time for operation: 4 years.
Estimated capital cost: $1,669,200.
Estimated O&M (present-worth): $864,600.
Estimated total cost (present-worth): $2,534,000.

Alternative 3A — Ex Situ Solid-Phase Biological/SVE Treatment

The components of this alternative are as follows:

- Groundwater extraction at a rate of 30 gpm to dewater the contaminated soils in preparation for excavation.

- SVE and gaseous-phase carbon treatment of the collected vapors.

- On-site treatment of extracted groundwater with the existing GWTP that consists of greensand filtration, activated carbon adsorption, and subsequent discharge to the base sanitary sewer.

- Excavation and ex situ solid-phase biological/vapor extraction treatment of 5,350 cubic yards (yd^3) (or less, if field screening indicates that removal of the full amount is not necessary) of contaminated soil.

- Backfilling of soils not requiring treatment (approximately 6,550 yd^3) that were excavated to access soils exceeding cleanup goals in the excavation, following removal of contaminated soils.

- Backfilling of treated soils into the excavation following remediation.

- Environmental monitoring of soils to evaluate the effectiveness of the remedial action during the remedial process.

- Removal of remaining USTs and associated piping at the site.

Estimated time for design and construction: 18 months.
Estimated time for operation: 18 months.
Estimated capital cost: $1,265,600.
Estimated O&M (present-worth): $469,200.
Estimated total cost (present-worth): $1,735,000.

Alternative 4 — Thermal Desorption Treatment

The components of this alternative are as follows:

- Groundwater extraction at a rate of 30 gpm to dewater the contaminated soils in preparation for excavation.
- Excavation of 5,350 yd^3 of contaminated soils (or less, if field screening indicates that removal of the full amount is not necessary) and temporary stockpiling in a controlled storage area on site. Mixing and screening of soils would be performed prior to treatment.
- Thermal desorption treatment of contaminated soils with a mobile unit. The unit would have an estimated capacity of 50 tons/day, and one pass through the unit would be required.
- On-site treatment of extracted groundwater with the existing GWTP and subsequent discharge to the base sanitary sewer.
- Backfilling of soils not requiring treatment (approximately 6,550 yd^3) that were excavated to access soils exceeding cleanup goals in the excavation, following removal of contaminated soils.
- Backfilling of treated soils into the excavation following remediation.
- Environmental monitoring of soils to evaluate the effectiveness of the remedial action during the remedial process.
- Removal of remaining USTs and associated piping at the site.

Estimated time for design and construction: 2 years.
Estimated time for operation: 2 years.
Estimated capital cost: $3,512,000.
Estimated O&M (present-worth): Included in capital cost.
Estimated total cost (present-worth): $3,512,000.

Alternative 5A — Off-Site Treatment

The components of this alternative are as follows:

- Groundwater extraction at a rate of 30 gpm to dewater the contaminated soils in preparation for excavation.

- Excavation of 5,35 of con-minated soils (or less, if field screening indicates that remova the full amount is not necessary) and transport to an approved off-site treatment/disposal facility.

- On-site treatment of extracted groundwater with the existing GWTP, with greensand filtration and carbon adsorption as process units and subsequent discharge to the base sanitary sewer.

- Backfilling of 6,550 yd^3 of soils not requiring treatment that were excavated to access soils exceeding cleanup goals in the excavation, and additional backfilling with clean fill following removal of contaminated soils.

- Environmental monitoring of soils to evaluate the effectiveness of the removal action.

- Removal of remaining USTs and associated piping at the site

Estir ted time for design and construction: 1 year.
Estimated time for operation: 1 year.
Estimated capital cost: $1,614,000.
Estimated O&M (present-worth): Included in capital cost.
Estimated total cost (present-worth): $1,614,000.

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Section 121(b)(1) of CERCLA presents several factors that must be considered when assessing alternatives. Building on these specific statutory mandates, the NCP has promulgated nine evaluation criteria to be used in as individual remedial alternatives. A detailed analysis was performed on the alternatives the nine evaluation criteria to select a site remedy. A summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria is presented as follows.

Threshold Criteria

The two threshold criteria that follow must be met for the ternatives to be ible for selection in accordance with the NCP:

1. *Overall protection of human health and the environment* addresses whether a remedy provides adequate protection and describes how risks posed through

each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. *Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)* addresses whether a remedy will meet all of the ARARs or other federal and state environmental laws, and/or will provide grounds for invoking a waiver.

Primary Balancing Criteria

The following five criteria are used to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

3. *Long-term effectiveness and permanence* addresses the criteria that are used to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

4. *Reduction of toxicity, mobility, or volume (TMV) through treatment* addresses the degree to which alternatives employ recycling or treatment that reduces the TMV of contaminants, including how treatment is used to address the principal threats posed by the site.

5. *Short-term effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved.

6. *Implementability* addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. *Cost* includes estimated capital, operation and maintenance (O&M), and present-worth costs.

Modifying Criteria

The modifying criteria that are used in the final evaluation of remedial alternatives generally after public comment on the RI/FS and Proposed Plan are received are as follows:

8. *State acceptance* addresses the state's position and key concerns related to the preferred alternative and other alternatives, and the state's comments on ARARs or the proposed use of waivers.

9. *Community acceptance* addresses the public's general response to the alternatives described in the Proposed Plan and RI/FS Reports.

A detailed tabular assessment of each alternative according to the nine criteria is presented in Tables 5.2-1 through 5.2-5 of the Site 34 FS Report.

Following the detailed analysis of each individual alternative, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. This comparative analysis is summarized in Table 5 in Appendix A.

The following subsection presents the nine criteria, including the two modifying criteria not discussed in the FS; a brief narrative summary of the alternatives; and the alternatives' strengths and weaknesses according to the detailed and comparative analysis.

A. **Overall Protection of Human Health and the Environment**

The no-action alternative (Alternative 1) would not meet this criterion in its entirety. The use of deed restrictions on property use would preclude use of site groundwater and future activities that could disturb source area soils; however, this alternative does not provide any minimization of leaching potential of source area soil contaminants to groundwater. Additionally, Alternative 1 does not result in a reduction in soil contaminant TMV, except by natural processes.

Alternatives 2A, 3A, and 4 provide on-site treatment of contaminated source area soils and, therefore, reduce the potential for contaminant leaching from source area soils to groundwater. This would result in a lower potential for human and ecological receptors to be exposed to contaminated soils. All three alternatives result in a reduction of TMV of source area contaminants in both soil and groundwater.

Also, by treating the source area soils on-site, liability is not transferred from the original site to an off-site disposal facility as for Alternative 5A.

Alternative 5A also minimizes the leaching of source soil contaminants to groundwater by removing contaminated soils from the site. However, the degree of reduction in TMV of soil contaminants at the off-site treatment/disposal facility is unknown because the process would be determined at the time of remedial design to provide the most cost-effective solution.

Implementation of Source Control Alternatives 2A, 3A, 4, and 5A would ultimately aid in achieving the groundwater cleanup goals that will be presented in the Zone 3 FS Report.

B. Compliance with ARARs

Each alternative was evaluated for compliance with ARARs, including chemical-, action-, and location-specific ARARs. These alternative-specific ARARs are presented in Appendix F of the Site 34 FS Report.

In the long term, all of the source control alternatives, including the no-action/institutional control alternative, would achieve chemical-specific ARARs for soil; however, the alternatives differ in the time it would take to achieve compliance.

With the exception of the no-action/institutional control source control alternative (Alternative 1), all of the source control alternatives would meet, in time frames ranging from 1 to 4 years, all soil ARARs. In this time frame, Alternative 1 would, most likely, not comply with the State of New Hampshire requirement that soils containing spills of virgin petroleum products achieve a 1 ppm total BTEX concentration. All other alternatives would meet this requirement.

The ability of source control alternatives to achieve chemical-specific ARARs in groundwater was not evaluated in the Site 34 FS. However, all alternatives that involve extraction and treatment of groundwater would achieve groundwater treatment goals and/or surface water discharge treatment goals prior to groundwater disposal.

It is expected that all alternatives would comply with action- and location-specific ARARs, except the New Hampshire Virgin Petroleum Policy with regard to treated soil disposal. The policy indicates that soil requiring treatment should not be placed within 0.5 mile of a water supply well. As the Haven well is less than the prescribed 0.5 mile, Alternatives 3A and 4 would not meet this location-specific ARAR. However, it should be noted that a groundwater divide exists between Site 34 and the Haven Well, such that contamination from Site 34 groundwater is highly unlikely to reach the Haven Well as the groundwater flow is away from the Haven Well.

C. <u>Long-Term Effectiveness</u>

Since Alternative 1 would not be effective in reducing contaminant leaching to groundwater, potential human health and environmental risks associated with untreated source area soils would still exist. As previously indicated, leaching would reduce the concentrations of contaminants of concern, but this would require many years to achieve and would result in continuing groundwater contamination.

Alternatives 2A, 3A, 4, and 5A all involve removal and/or reduction of contaminant concentrations in source area soil. It is expected that all of these alternatives would achieve a residual soil BTEX concentration of 1 ppm; would, therefore, reduce further unacceptable leaching; and, in turn, would reduce contaminant concentrations in source area groundwater. The 1-ppm total BTEX limit is based on a state policy for virgin petroleum products (F-338). Therefore, these alternatives would provide the same level of long-term protectiveness to human health and the environment and differ primarily in the time required to achieve cleanup goals. Because it is difficult to predict the effectiveness of in situ treatment, it was assumed at this time that this technology could achieve the same degree of organic contaminant removal as alternatives involving excavation and treatment or disposal. All four of the action alternatives would further reduce current risks to human health and the environment resulting from ingestion of, and dermal contact with, contaminated soils. This would be attributable predominantly to the treatment or removal of PAHs, which contribute to human health risks exceeding 10^{-6}. Alternatives 4 and 5A would likely provide the greater decreases in risks, since the biological processes in Alternatives 2A and 3A may not provide as significant treatment of PAHs. However, as the risk is below acceptable levels, this does not greatly affect comparative effectiveness.

D. Reduction in Toxicity, Mobility, or Volume Through Treatment

Because it does not involve treatment of source area soils, Alternative 1 would not provide a reduction in contaminant TMV other than natural attenuation that would occur over many years. It is expected that Alternatives 2A, 3A, and 4 would all provide the same order of magnitude reduction in TMV of source area soil contaminants through treatment. Alternative 5A, which involves excavation and off-site disposal of source area soils, would greatly reduce the volume of soil contaminants present at Site 34; however, the degree of overall reduction in contaminant TMV that would occur at an off-site facility is unknown, as the treatment/disposal method would be determined at the time of remedial design.

All of the alternatives that incorporate extraction and treatment of groundwater would involve some reduction in TMV of contaminants in source area groundwater.

E. Short-Term Effectiveness

Implementation of Alternative 1 involves the fewest short-term impacts on human health and the environment because it does not involve activities that would disturb contaminated soil. However, this alternative would not provide any reduction in source area soil contamination other than natural attenuation that would occur over time; therefore, protection of human health and the environment would not be achieved for many years.

Alternatives 3A, 4, and 5A all involve similar short-term impacts on site workers, the surrounding community, and the environment as they all involve excavation and subsequent handling of source area soils. However, because Alternative 5A involves off-site disposal rather than on-site treatment, there may be fewer impacts on site workers and the surrounding community than for Alternatives 3A and 4 because of fewer on-site soil handling activities.

However, there would be potential risks to communities associated with accidental spills that could occur during transport to the disposal facility.

Potential impacts on workers and the surrounding community would be associated with the release of vapors (volatile BTEX constituents) and particulates during excavation and soil handling activities. Methods that would be implemented to ensure the protection of workers and area residents during soil excavation and treatment are considered reliable and include use of interim geomembrane covers on exposed source area soils, use of appropriate worker personal protective equipment (PPE), implementation of dust and odor suppression techniques to control fugitive dust emissions, and continuous air monitoring to evaluate site conditions.

Implementation of Alternative 2A, which involves in situ treatment of source area soil, would involve fewer short-term impacts on site workers and the surrounding community than Alternatives 3A, 4, and 5A because it does not involve extensive excavation and subsequent handling of source area soils. This alternative may, however, have a greater impact on surrounding wetlands environments because of long-term (2 to 4 years) dewatering of source area soils. The alternatives involving excavation (Alternatives 3A, 4, and 5A) would have a slight impact on the wetlands because approximately 0.25 acre would be excavated and/or used as access to the excavated area and would require restoration. Wetlands delineation for Site 34 and all of Zone 3 is shown in Figure 6. The area impacted as a result of dewatering for Alternative 2A is difficult to predict; however, restoration would occur naturally when the water table returns to its static level. Potential impacts on wetlands from Alternative 2A will be evaluated after the Zone 3 groundwater modeling effort is completed.

Alternatives 3A, 4, and 5A, which involve installation of on-site treatment systems and/or stockpiling of excavated soil, may require clearing of surrounding woodlands. However, precautions would be taken to minimize the impacted areas by using existing cleared areas effectively.

Alternative 5A would likely achieve protection sooner than the other alternatives because it involves off-site disposal; however, this would depend ultimately on the time frame over which the disposal facility can accept excavated soils. It is expected that Alternative 4 could achieve protection in one construction season, while Alternative 3A could achieve protection in one or two construction seasons. Alternative 2A would require several years to achieve protection. As previously indicated, Alternative 1 would not achieve protection for many years.

F. Implementability

Alternative 1 would be the most readily implementable alternative because it involves the fewest remedial activities. Alternative 2A would be the most difficult alternative to implement technically because it involves in situ treatment, which is, in general, not as well-proven and more difficult to control than ex situ treatment processes. This alternative involves numerous activities including dewatering of source area soils, distribution of nutrients, and implementation of SVE. All of these activities would have to be carefully controlled to maintain aerobic degradation. Many site-specific conditions could interfere with the implementation of these activities, thus inhibiting the ability to achieve successful biotreatment of source area soil contamination. Because Alternative 2A also involves more extensive groundwater extraction than the other alternatives, the existing groundwater treatment system would have to be modified, thereby complicating the implementation of this alternative to a greater level than the other remedial alternatives.

Alternatives 3A and 4, which both involve excavation and on-site treatment of source area soils, would be similar in ease of implementation. Both of these technologies are fairly well-developed and have been used successfully at other sites. However, site-specific conditions could complicate implementation of these technologies at Site 34. For example, potential site-specific difficulties associated with implementation of low-temperature thermal desorption (Alternative 4) may include possible soil handling problems because of high moisture content and/or silty soils that could significantly affect system throughput and cost. Both of these treatment technologies would require preliminary bench-scale and, possibly, pilot-scale testing prior to implementation of the technology. No major technical problems associated with bench- or pilot-scale testing are expected.

It is expected that Alternative 5A, which involves soil excavation and off-site disposal, would be the alternative most easily implemented technically, except for Alternative 1.

In terms of administrative feasibility, Alternative 4 would be the most difficult alternative to implement administratively because it would likely require the greatest time for obtaining agency permits/approvals. Thermal desorption would require rigorous testing to ensure compliance with applicable air quality requirements. Alternative 5A, which involves off-site disposal of source area soil, would require federal and state agency permits for off-site transportation and disposal, which should be easy to obtain, and consultation with the selected disposal facility to ensure that the excavated material is within specifications.

All of the alternatives involve technologies and services that are readily available through multiple vendors. Treatment, storage, and disposal facilities also are readily available to accept treatment residuals.

G. Cost

The estimated present-worth costs of the alternatives follow:

	Remedial Alternative	Capital Cost	30-Year Present-Worth O&M Cost	Present-Worth Cost
1.	No Action/Institutional Controls	$8,300	$358,700	$367,000
2A.	In Situ Soil Aerobic Biological Treatment with SVE and On-Site Groundwater Extraction and Treatment with On- and Off-Site Disposal	$1,669,200	$864,600	$2,534,000
3A.	Excavation and On-Site Ex Situ Biological/Vapor Extraction Treatment of Contaminated Soil and On-Site Disposal, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	$1,265,600	$469,200	$1,735,000
4.	Excavation and On-Site Thermal Desorption of Contaminated Soil and On-Site Disposal, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	$3,512,000	All O&M costs have been incorporated into the estimated capital cost because of the short duration of the remedial action.	$3,512,000
5A.	Excavation and Off-Site Treatment and/or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	$1,614,000	All O&M costs have been incorporated into the estimated capital cost because of the short duration of the remedial action.	$1,614,000

H. State Acceptance

NHDES has been involved in oversight of the study of Pease AFB since the mid-1980s, as summarized in Section II. NHDES, as a party to the FFA, has reviewed this document and concurs with the selected remedy. A copy of the Declaration of Concurrence is attached as Appendix C.

I. Community Acceptance

The comments received during the public comment period and the public hearing on the Proposed Plan and FS are summarized in the Responsiveness Summary (see Appendix D). The selected remedy has not been significantly modified from that presented in the Proposed Plan.

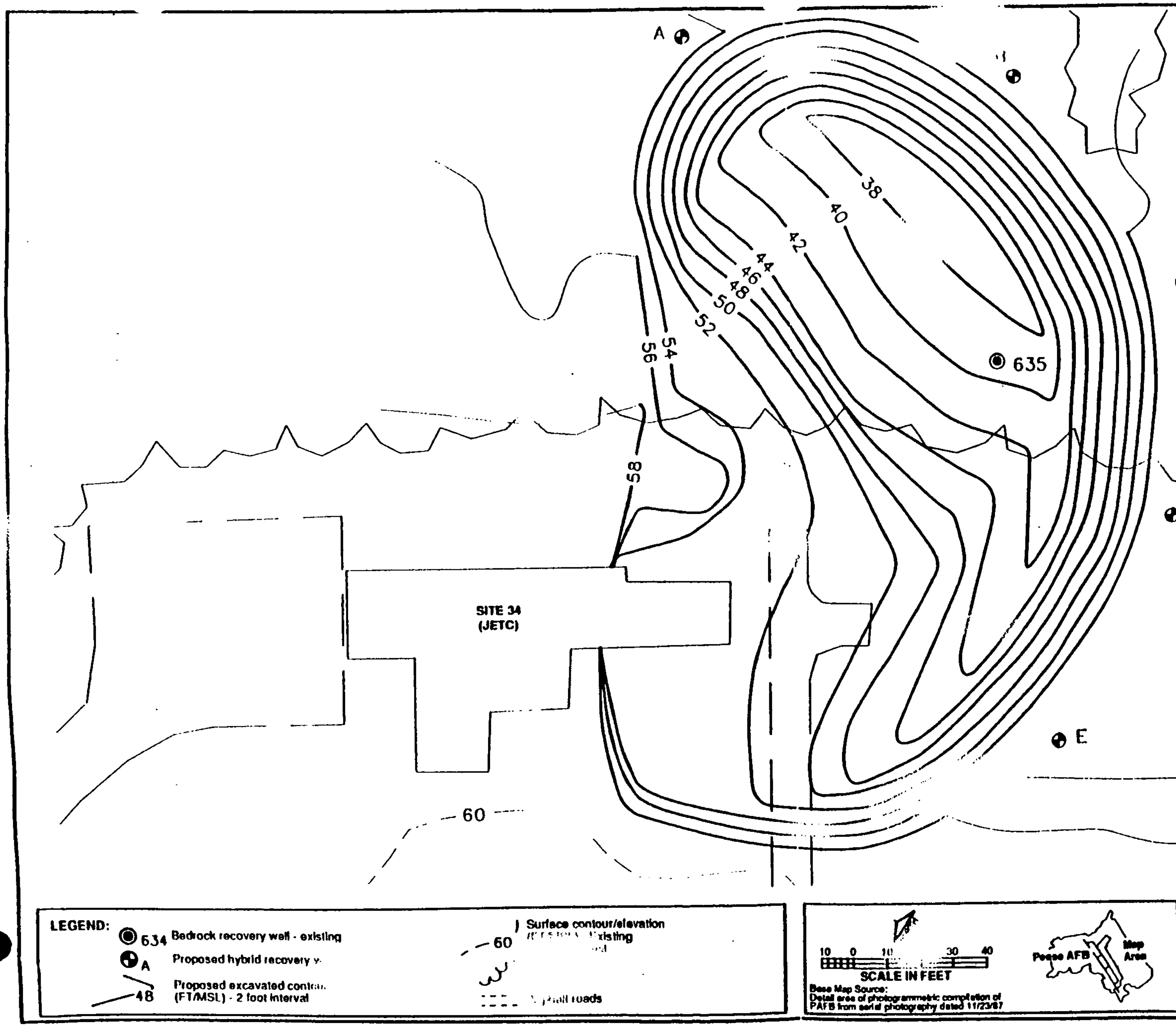
X. THE SELECTED REMEDY

The remedy selected for the JETC (Alternative 5A) involves the excavation of source area soils (shown in Figure 7), with on-site treatment of groundwater extracted for dewatering purposes. The soil will be sent to an off-site treatment/disposal facility. A remedial process flow sheet for Alternative 5A is presented in Figure 8.

Several options are available for off-site treatment and/or disposal of contaminated soil at Site 34. The disposal will be in accordance with all applicable regulations at the time of disposal, and the actual method of disposal or treatment will be determined during the design phase. The treatment/disposal options include:

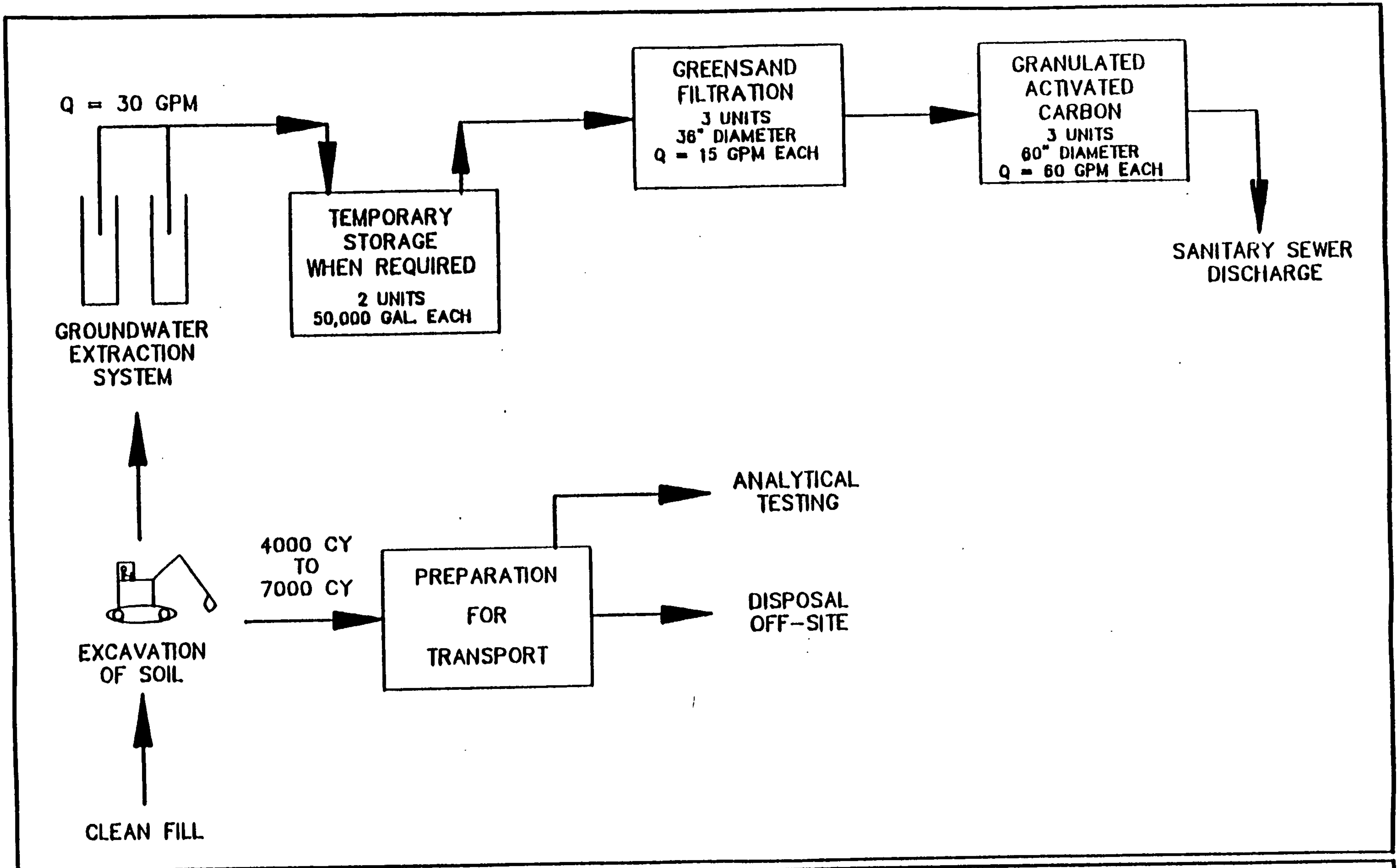
- Remote (on-/off-base) treatment/disposal facilities such as:
  - Incinerators.
  - Low-temperature thermal treatment units.
  - Asphalt batching plants.
  - Landfills..

With respect to off-base facilities, it is important to consider possible treatment requirements. EPA's land disposal restrictions and treatment standards would only apply if the contaminated



Site 34 (JETC)
, Record of Decision
Pease Force Base, New Hampshire

FIGURE 7
PROPOSED EXCAVATION FOR REMOVAL OF SOIL CONTAMINATED WITH ORGANICS



LEGEND

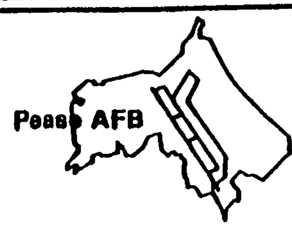


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FIGURE 8
REMEDIAL PROCESS FLOW SHEET FOR ALTERNATIVE 5A

soil were to be classified as a hazardous waste. The soil would be a hazardous waste if it failed the TCLP test and was not considered exempt from RCRA because of the petroleum product exemption. However, JETC soils were tested and did not exceed TCLP criteria and, therefore, would be classified as nonhazardous materials. Total petroleum hydrocarbon (TPH) concentrations in the Test Cell Ditch sediments were in the same range of concentrations (1,000 to 10,000 mg/kg) observed in soil samples from the site. It is therefore reasonable to expect that the site soils would pass the TCLP as a nonhazardous waste, and treatment would not be required before disposal. Subsection 2.2 of the Draft Final Site 34 FS Report discusses the exclusion for petroleum-contaminated media that fail the TCLP.

There are at least two commercial landfil[illegible] n the region that would accept the untreated soils. This option would provide strictly for disposal, not treatment, of the contaminated soils. The nearest commercial incinerators designed to treat contaminated soil are located several hundred to more than 1,000 miles from the site. Off-site incineration is not a cost-effective method of managing Site 34 soils.

Low-temperature thermal treatment, using technology as described for Alternative 4, is a more realistic option than incineration for the off-site treatment of nonhazardous petroleum-contaminated soils. A number of permitted facilities in New Hampshire are capable of providing this service. The soil would be excavated and transported to the treatment facility, and the decontaminated soil could either be returned to the site for backfilling, or used for some other application (e.g., landfill cover). The use of a thermal desorption unit for several sites may be a viable option depending on remediation activities planned for other sites on base.

An option that provides for both treatment and resource recovery is the incorporation of the contaminated soils as aggregate into asphalt paving material. There are at least two asphalt batching plants within 50 miles of the site that provide this service, one of which has already been used to treat and dispose of the sediments removed from the Test Cell Ditch. The cost of off-site treatment and resource recovery is comparable with off-site landfill disposal.

Asphalt batching or low-temperature thermal treatment appear to be the preferred options for managing Site 34 soils on-base or off-site, provided the assigned facility complies with all permit requirements. The petroleum-contaminated soils would have to meet the qualification and quantification standards established by NHDES policy and the specific standards of the treatment facility. NHDES sets minimum requirements for analytical methods, acceptable limits, and frequency of sampling. Based on the Test Cell Ditch sediment removal and disposal, the treatment and disposal of Site 34 soils in an asphalt batching process or on-base thermal desorption unit appears to be feasible.

A. Methodology for Soil Cleanup Goal Determination

Since only sources of contamination at Site 34 are being addressed at this time, the only medium evaluated in the FS and the ROD are site soils. The need for action on the site soils was initially evaluated for direct human and ecological receptor contact and the potential for soil contaminants to leach to and adversely impact groundwater above applicable standards.

Based on data developed in the RI and the BRA, remedial measures to address risk associated with possible human and ecological receptor exposure to source soils are not warranted because present and future risks are within or below EPA's acceptable risk range. However, available data suggest that area soils are a potential source of release of VOCs to groundwater. This potential release may result in an unacceptable risk to human receptors who may come in contact with contaminated groundwater. Therefore, cleanup levels for soils were established to protect the water-bearing unit from potential unacceptable soil leachate. The Summers Model was used to estimate residual soil cleanup goals that are not expected to impair future groundwater quality. Interim cleanup levels for groundwater were used as input into the leaching model. Final groundwater cleanup goals will be developed as part of the Zone 3 FS. Tables 6 and 7 in Appendix A present the input data for the leaching model.

If the predicted protective soil cleanup goal concentrations were not capable of being detected with good precision and accuracy, then the practical quantification limits of the common soil analytical methods were selected as the cleanup goals for soils. The contaminants evaluated for potential leaching cleanup goals were the contaminants of concern in soil and contaminants detected in both soil and groundwater. Table 8 in Appendix A summarizes the soil cleanup goals required to protect public health and the water-bearing unit from exceeding standards based on leaching of chemicals from soils to groundwater. The leaching potential was determined for organics only. The Summers Model results were then compared to maximum detected concentrations in soil and to ARAR values. Only one organic contaminant of concern exceeded a Summers Model value. Although 2-Butanone exceeded the leaching-based cleanup goal, it was decided that as only one location exceeded the leaching-based cleanup goal, and 2-butanone is a common laboratory contaminant, it did not warrant remediation.

Since the model did not indicate the need for remediation based on leaching potential alone, the soil cleanup goals were based on the NHDES Virgin Petroleum Products Policy, which allowed a maximum value of 1 ppm total BTEX in soil. The NHDES cleanup goals were chosen because this regulation is appropriate for this situation. At the request of EPA Region I, Table 9 in Appendix A was developed and presents the human health risks associated with the soil cleanup goals chosen. It should also be noted at this time that monitor wells in the source area (617 and 6041) clearly indicate that the groundwater at Site 34 is being adversely impacted. It is anticipated that source area activities will help to reduce the groundwater contaminant levels and result in a shorter time required for groundwater remediation.

These cleanup levels in soils are consistent with ARARs for groundwater, attain EPA's risk management goal for remedial actions, and have been determined by EPA to be protective of human health and the environment. These cleanup goals must be met at the time of implementation. The area of excavation is shown on Figure 7.

B. Groundwater Treatment Goals

The target levels developed in the FS are only intermediate values for groundwater treated in conjunction with source control actions; final groundwater remediation objectives have been developed in the Zone 3 Draft FS.

At the time of Site 34 FS Report preparation, groundwater was not under evaluation at the JETC; however, groundwater will be evaluated fully in the Zone 3 RI and FS Reports. Target treatment levels for groundwater were developed for groundwater extracted during source area remedial activities. The target treatment levels, presented in Table 10 in Appendix A, are based on MCLs, not site-specific risk-based values. These levels are considered to be target treatment levels only for groundwater extracted for source area remedial activities.

The extraction of groundwater during remedial activities is only designed to provide easier access to contaminated soils. Source area groundwater and management of migration groundwater has been addressed in a separate Zone 3 FS document. A risk assessment has been performed on groundwater contamination at the JETC as part of the Zone 3 Draft RI Report to determine whether groundwater remedial action is warranted, and final groundwater cleanup goals have been established for Zone 3 in the Zone 3 Draft Feasibility Study.

C. Target Surface Water Discharge Concentrations

At the time of Site 34 FS Report preparation, surface water was not fully evaluated at the JETC. Surface water has subsequently been evaluated in the Zone 3 Draft RI and Draft FS Reports.

However, target treatment levels for groundwater were developed in the Site 34 Draft Final FS Report for discharge of treated groundwater to surface water during source area remedial activities. The target treatment levels are presented in Tables 2.5-6 and 2.5-7 in the Draft Final Site 34 FS Report, and are based on AWQC, not site-specific risk-based values.

These levels are considered to be target treatment levels for surface water discharge of treated groundwater extracted for source area remedial activities. A BRA will be performed on surface water contamination as part of the Zone 3 RI Report to determine whether surface water remedial action is warranted.

D. Description of Remedi... Comp...nents

The remedy chosen for the JETC, whose main remedial goal is source control, will involve the following key components:

- Excavation of JETC soils that contain contaminant concentrations exceeding site-specific cleanup goals. A mobile laboratory will be on-site to confirm the removal of contamin...d material. The excavated material will be temporarily stored and dewatered, on-site, prior to removal to the off-site facility.

- The ex...vation will b... backfilled with clean fill to a level that matches existing grade ... the site.

- Excavated contamin... materials will be transported to a treatment/disposal location as soon as ...eduling all... The type of disposal facility will be chosen (i.e., asphalt batch, RCRA ..., Subtitle D landfill, on-base thermal desorption unit, or other) at the tim... ...emedial design based on cost and other factors.

- Groundwater extracted as part of the excavation and/or dewatering process will be treated at the existing pilot GWTP. Holding tanks will be provided for storage of groundwater prior to treatment.

- Prior to completion of remedial activities, EPA and NHDES will conduct a review as part of the regulator... approval process to ensur... ...at the remedial soil cleanup goals have been me...

Figures 7, 8, and 9 provide a plan of the estimated excavation area, process flow sheet, and available staging area at Site 34, respectively. Detailed descriptions of the various components are provided in this subsection.

It is expected that 5,... yd^3 of soils from Site 34 will be excavated; volumes are presented in the following table. Of the possible total of 5,350 yd^3, up to 1,200 yd^3 may need to be excavated using wet excavation techniques and/or draining of the excavation via pumping from the bottom of the hole. As discussed previously, the fin... volume removed will be determined at the time of remediation using field screening techniques. The ...olumes presented are estimat... and are subject to field verification.

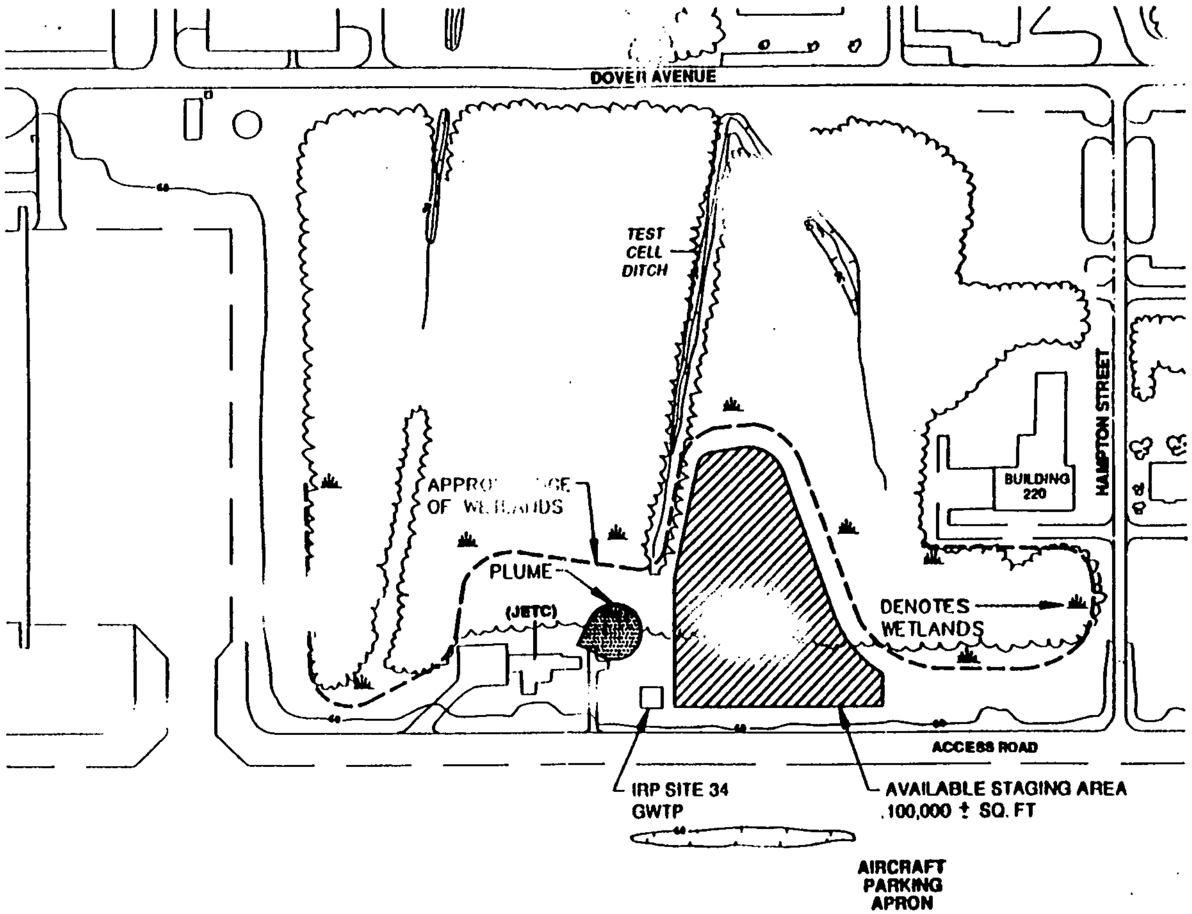
Total Volume Required for Excavation			11,900 yd^3
	Total Volume of Excavated Soils not Requiring Treatment		6,550 yd^3
	Total Volume of Excavated Soils Requiring Treatment		5,350 yd^3
		Cohesive Volume	1,660 yd^3
		Noncohesive Volume	3,690 yd^3

Since a portion of the area to be excavated will result in destruction of adjacent wetlands, erosion and sedimentation controls, as well as careful excavation, will be used in the soil removal in these areas. Any wetlands adversely impacted will be restored.

During excavation and temporary storage activities, erosion runoff and VOC and particulate emissions will be controlled via the use of a temporary runoff detention area adjacent to the stockpile, and placement of a geomembrane on the stockpile and sideslopes of the excavation areas. Continuous on-site air monitoring also will be conducted during excavation and stockpiling activities.

Some dewatering of the excavation area will occur with the use of well points, which will extract groundwater at a rate of approximately 30 gpm. Following extraction, groundwater will be stored in five 20,000-gallon storage tanks. Groundwater will then be treated at the existing pilot GWTP at Site 34, which consists of potassium permanganate injection in conjunction with greensand filtration for iron and manganese removal followed by activated carbon adsorption for VOCs removal. Treated effluent will meet groundwater treatment goals as presented in Subsection 2.5 of the Site 34 FS Report, and will be discharged to the base sanitary sewer system.

Excavated soil could potentially be transported to an asphalt batch facility, RCRA TSD facility, Subtitle D landfill, or an on-base mobile thermal desorption unit. The treatment/disposal method will be chosen during remedial design phase based on cost and analytical testing prior



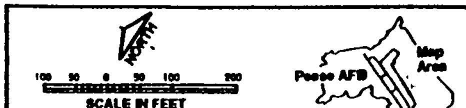
LEGEND:

Wetlands boundary

60 Surface contour/elevation (FT/MSL) - Existing 10 foot interval

Tree line

Asphalt roads



Base Map Source:
Detail area of photogrammetric compilation of PAFB from aerial photography dated 11/23/87

Site 34 (JETC)
Stage 3, Record of Decision
Pease Air Force Base, New Hampshire

FIGURE 9
AVAILABLE STAGING AREA

to removal activities, and will reflect the statutory preference for treatment contained in CERCLA Section 121(b).

XI. STATUTORY DETERMINATIONS

The remedial action selected for implementation at the Pease AFB JETC site is consistent with CERCLA and, to the extent practicable, the NCP. The selected remedy is protective of human health and the environment, attains ARARs, and is cost effective. The selected remedy also may satisfy the statutory preference for treatment that permanently and significantly reduces the TMV of hazardous substances as a principal element. Additionally, the selected remedy uses alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

A. The Selected Remedy is Protective of Human Health and the Environment

The remedy at the site will permanently reduce the risks posed to human health and the environment by eliminating, reducing, or controlling exposures to human and ecological receptors through treatment and by engineering controls, more specifically:

- Excavation of contaminated soil and transport to an off-site treatment/disposal facility will reduce the leaching potential of contaminants from soil to groundwater, which would result in unacceptable levels in groundwater.
- Treatment of water extracted during construction dewatering will reduce the toxicity of the water prior to discharge.
- Backfilling with clean materials will allow future unrestricted use of the site.

B. The Selected Remedy Attains ARARs

The selected remedy will attain all of the substantive, non-procedural requirements of federal and state ARARs. ARARs for Site 34 are set forth in Table 11 of Appendix A to this document which contains a complete list of ARARs, including the regulatory citation, and a brief summary of the requirement, and the action to be taken to attain the requirement. In addition, policies, criteria, and guidelines (to be considered, or "TBCs") will also be considered during the implementation of the remedial action.

- Chemical-Specific ARARs.
  - None
- Location-Specific ARARs.
  - Fish and Wildlife Coordination Act (FWCA).
  - State of New Hampshire Regulations.
- Action-Specific ARARs.
  - Hazardous Materials Transportation Act (HMTA).
  - CWA.
  - CAA.
  - State of New Hampshire Regulations.
- To Be Considered (TBCs) Criteria.
  - EPA Health Advisories (HAs).
  - EPA Risk Reference Doses (RfDs).
  - EPA Carcinogen Assessment Group Potency Factors.
  - NH Interim Policy for the Management of Soils Contaminated From Spills/Releases of Virgin Petroleum Products.

The basewide ARARs document (F-530) identifies ARARs for Pease AFB, and Appendix B identifies those for Site 34, and provides detailed discussions of both ARARs and TBCs. Table 11, in Appendix A of this document, provides a complete list of ARARs and TBC criteria for Alternative 5A, including regulatory citations, requirement synopses, actions to be taken to attain the requirements, and determinations as to whether the requirements represent ARARs or TBCs criteria.

Federal and State Drinking Water Regulations. Although not an ARAR, Federal and State Drinking Water Standards were used in the development of soil cleanup goals based on leaching. The drinking water standards were entered into a leaching model to estimate soil concentrations which would not cause groundwater to exceed the drinking water ARARs.

Drinking water standards, MCLs and other guidance and criteria to be considered (TBCs) were also used to develop of target cleanup levels for the remediation of groundwater extracted during construction dewatering at the site.

Chemical-specific ARARs and risk-based target cleanup levels will be met by extracting the contaminated groundwater within the area of excavation, reducing the potential for leaching.

Federal and State Pretreatment Standards. The preferred option is discharge of treated water to the base POTW. Under this option, discharge limits would be based on factors regulated by the POTW's existing NPDES permit, pretreatment regulations, and water pollution control laws. Pretreatment standards would be developed with the POTW. Both the Pretreatment Standards and CWA NPDES will be attained upon successful establishment of pretreatment standards for discharge from the groundwater treatment plant.

Federal and State Air Quality Regulations. The treatment technologies proposed in the selected remedy will not create any new sources of air emissions. Therefore, many federal and state regulations governing air quality do not apply to the selected remedy. The only air quality standards that are applicable are particulate standards promulgated under the Clean Air Act and New Hampshire Ambient Air Quality Standards. The particulate standard would apply to remedial construction activities. These standards would be attained through monitoring and, if necessary, use of dust suppression techniques or engineering controls.

It :oted that, although the requirements, standards and regulations of the Occupational Safety and Health Act of 1970, 29 U.S.C., et seq. are not ARARs, they will be followed throughout the Site 34 remedial activities where necess. See 55 Federal Register 86 9-80, March 8, 1990.

It is also noted that the following New Hampshire requirements and guidance, classified as TBCs, will be followed: NH Administrative Code, Env-Ws 411, Control of Underground Storage Facil s; NH Administrative Code, Env-Ws 412, Reporting and Remediation of Oil Discharges; and NH Interim Policy for the Management of Soils Contaminated from Spills/Releases of Virgin P leum P ucts. se state requirements and guidance are TBCs because they re to the c a-up c roleum products which are not ha ious substances as defined by CERCLA. However, since the soil to be remediated at Si 4 contains such petroleum products, the Air Force will follow the requirements as appropriate.

C. The Selected Remedial Action is Cost Effective

In the judgment of the Air Force, the selected remedy is cost effective (i.e., the remedy affords overall effectiveness proportional to its costs). Once alternatives that were protective of human health an he environment and th ner attain or, as appropriate, waive ARARs were identified, the overall effectiveness of each alternative was evaluated by assessing the relevant three criteria: long-term effectiveness and permanence, reduction in TMV of contaminants through treatment, and short-term effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs.

A summary of the costs associated with each of the source control remedies is presented as follows. All costs are presented in net present-worth costs.

Remedial Alternative		Capital Cost	30-Year Present-Worth O&M Cost	Present-Worth Cost
1.	No Action/Institutional Controls	$8,300	$358,700	$367,000
2A.	In Situ Soil Aerobic Biological Treatment with SVE, and On-Site Groundwater Extraction and Treatment with On- and Off-Site Disposal	$1,669,200	$864,600	$2,534,000
3A.	Excavation and On-Site Ex Situ Biological/Vapor Extraction Treatment of Contaminated Soil and On-Site Disposal, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	$1,265,600	$469,200	$1,735,000
4.	Excavation and On-Site Thermal Desorption of Contaminated Soil and On-Site Disposal, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	$3,512,000	All O&M costs have been incorporated into the estimated capital cost because of the short duration of the remedial action.	$3,512,000
5A.	Excavation and Off-Site Treatment and/or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	$1,614,000	All O&M costs have been incorporated into the estimated capital cost because of the short duration of the remedial action.	$1,614,000

Of the aforementioned alternatives, four attain ARARs and are protective: Alternatives 2A, 3A, 4, and 5A. Alternative 5A is the most cost-effective alternative overall, and provides a degree of protectiveness proportional to its cost. Alternative 3A is 7.5% more costly than 5A and does provide slightly more protection to human health and the environment; however, this additional protection is not necessary since the risk to human health and the environment at the JETC is acceptable under both alternatives.

Alternative 5A provides greater short-term effectiveness at a lower cost than Alternative 3A or 4. Alternative 5A provides equal or greater long-term effectiveness, reduction in TMV (dependant upon final treatment/disposal chosen at the time of remedial design), implementability, and compliance with ARARs and TBC criteria as Alternatives 2A, 3A, and 4, but at a lower cost. The costs for Alternatives 3A and 5A were very nearly the same;

however, the time until remediation is completed is very different. Alternative 3A would require approximately 2 years, while Alternative 5A would most likely not require more than 6 months. Continuous pumping of the water-bearing zone at the high rates required for Alternative 2A could adversely affect wetlands in the area by inhibiting groundwater recharge of the wetlands. Alternative 1 (no action) does not meet ARARs and would not provide any additional protection of human health and environment. A summary of costs for key elements of the selected source control remedy (Alternative 5A) is presented as follows. All costs are net present-worth.

Component of Remedy	Present-Worth Cost
Upgrade of existing groundwater extraction and treatment systems	$73,056
One year of O&M of groundwater extraction and treatment systems	$111,351
Drainage and erosion controls	$12,466
Staging area for stockpiling and treatment of contaminated soil	$42,000
Excavation and removal of four USTs and JETC drainpipe	$13,300
Soil excavation and stockpiling	$203,450
Off-site treatment/disposal of soil	$524,300
Backfilling and site restoration	$84,625
Miscellaneous	$104,750
TOTAL	$1,169,298

Miscellaneous includes mobilization/demobilization, access restrictions, health and safety, air monitoring, and SARA review upon completion. Contingency costs and additions and O&M costs are not listed as they are in the table on the previous page.

D. The Selected Remedy Uses Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

Once the Air Force identified those alternatives that attain or, as appropriate, waive ARARs and that are protective of human health and the environment, the Air Force identified which alternative uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by determining which alternative provides the best balance of tradeoffs among alternatives in terms of the following issues: (1) long-term effectiveness and permanence; (2) reduction in TMV of contaminants through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The balancing test *emphasized* long-term effectiveness and permanence and the reduction in TMV through treatment, and *considered* the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste, and community and state acceptance. The selected remedy provides the best balance of tradeoffs among the alternatives.

Alternative 5A slightly outranks Alternatives 2A, 3A, and 4 in terms of permanence; however, all four action alternatives (Alternatives 2A, 3A, 4, and 5A) have equal rank in long-term effectiveness. In addition, Alternatives 2A, 3A, and 4 place greater emphasis on treatment, but exceed the cost of Alternative 5A by 57%, 7.5%, and 117.5%, respectively, and do not reduce the TMV of contaminants any more than would Alternative 5A, which would most likely involve resource recovery/reuse technologies. Alternatives 2A, 3A, 4, and 5A involve some upgrades to the Site 34 GWTP that may be incorporated in to the Zone 3 groundwater remediation and as such possibly serve in both capacities. All four action alternatives would result in some adverse impact on wetlands, with Alternative 5A creating less impact because of a shorter time of remediation and less time until restoration occurs. Alternative 1 contains no provision for reduction in TMV of contaminants or for consideration of EPA's preference for treatment as a component of remediation.

E. The Selected Remedy and the Preference for Treatment that Permanently and Significantly Reduces the Toxicity, Mobility, or Volume of the Hazardous Substances as a Principal Element

The selected remedy may not satisfy the statutory preference for treatment which permanently and significantly reduces the toxicity, mobility or volume of hazardous substances as a principal element depending on the treatment and/or disposal method chosen at the time of implementation. The selected remedy is consistent with EPA's preference for containment of wastes which it is not practicable to treat.

The principal element of the selected source control remedy is off-site treatment/disposal of source area soil. This element addresses the primary threat at the site (contamination of groundwater resulting from leaching of source area soils), and complies with the NHDES Policy on Virgin Petroleum Products (F-338). The method of disposal or treatment of the excavated soils will be determined during the remedial design phase. The determination will reflect the requirement of CERCLA ¶120(b)(1) that states "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility hazardous substances, pollutants or contaminants is a principal element, are to be preferred over remedial alternatives not involving such treatment".

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

The Air Force presented a Proposed Plan (Alternative 5A) for remediation of the site in December 1992. The source control portion of the preferred alternative included:

- Excavation of contaminated soil and transport to an approved off-site treatment/ disposal facility. It is expected that approximately 5,350 yd^3 of contaminated soils would be excavated. Soil samples would be collected and analyzed as the operation concluded to ensure all soil above the cleanup goals was removed.

- Dewatering of the site during soil excavation and treatment of the extracted groundwater at the existing on-site treatment facility, with subsequent discharge to the base sanitary sewer.

- Backfilling of the excavation with excavated soil not requiring treatment or clean soil.

- Environmental monitoring during remedial operations.

- Removal of the remaining USTs and piping from the manhole to the Test Cell Ditch. This tank cluster and any remaining piping at the site will require removal incidental to excavation of the surrounding contaminated soil.

There have been no significant changes in the selected alternative since publication of the Draft Final Site 34 FS Report and Proposed Plan other than the removal of the JP-4 tank and the oil/water separator in fall 1992.

It should be noted that several regulations have been updated and some are now enforceable, where they were not previously. Appendix B presents Subsection 2.2 of the Draft Final Site 34 FS Report. Regulatory updates, as of the signing of this ROD, have been added to the appendix.

XIII. STATE ROLE

NHDES, as a party to the FFA, has reviewed the various alternatives and has indicated its support for the selected remedy. The state has also reviewed the Site 34 RI, BRA, and FS to determine whether the selected remedy is in compliance with ARARs. The State of New Hampshire concurs with the selected source control remedy for the JETC. A copy of the Declaration of Concurrence is attached as Appendix C.

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LIST OF ACRONYMS

AAL	ambient air limit
AFB	Pease Air Force Base
AFCEE/ESB	Air Force Center for Environmental Excellence/Base Closure Division
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BAT	best available technology
BCT	best conventional technology
BDAT	best demonstrated available technology
BGS	below ground surface
BMPs	Best Management Practices
BRA	Baseline Risk Assessment
BTEX	benzene, toluene, ethylbenzene, and xylene
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CTVs	Critical Toxicity Values
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DCE	dichloroethene
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DNAPL	dense, nonaqueous-phase liquid
DOD	Department of Defense
DOT	Department of Transportation
DRE	destruction and removal efficiency
DRED	Department of Resources and Economic Development
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft MSL	feet above mean sea level
FWCA	Fish and Wildlife Coordination Act
FWQC	Federal Water Quality Criteria
gpm	gallons per minute
GRS	groundwater remediation system
GT	Glacial Till
GWTP	groundwater treatment plant
HA	Health Advisory
HC	hydrocarbons
HCl	hydrogen chloride
HI	hazard index
HMTA	Hazardous Materials Transportation Act
HQ AFBDA	Headquarters Air Force Base Disposal Agency
HSDB	Hazardous Substances Data Bank
IRM	Interim Remedial Measure

LIST OF ACRONYMS
(Continued)

IRP	Installation Restoration Program
IS/PA	Industrial Shop/Parking Apron
ITR	Interim Technical Report
JETC	Jet Engine Test Cell
LDRs	land disposal restrictions
LNAPL	light, nonaqueous-phase liquid
LS	Lower Sand
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MCS	Marine Clay and Silt
MTBE	methyl tert-butyl ether
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHCAR	New Hampshire Code of Administrative Rules
NHDES	New Hampshire Department of Environmental Services
NHDPHS	New Hampshire Division of Public Health and Services
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NPDWS	National Primary Drinking Water Standards
NPL	National Priority List
NSDWS	National Secondary Drinking Water Standards
NSPS	New Source Performance Standards
O&M	operation and maintenance
O_3	Ozone
OSHA	Occupational Safety and Health Act
PAHs	polynuclear aromatic hydrocarbons
Pb	Lead
PCBs	polychlorinated biphenyls
PCSs	potential groundwater contamination sources
PDA	Pease Development Authority
PELs	Permissible Exposure Limits
POHC	principal organic hazardous constituent
POTW	publicly owned treatment works
PPE	personal protective equipment
RA	Risk Assessment
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI/FS	Remedial Investigation/Feasibility Study
RME	reasonable maximally exposed individual
ROD	Record of Decision
RQD	rock quality determination
RSA	Revised Statutes, Annotated
SCS	Site Characterization Summary

LIST OF ACRONYMS
(Continued)

SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
SO_2	sulfur dioxide
SVE	soil vapor extraction
TBC	to be considered
TCE	trichloroethene
TCFM	trichlorofluoromethane
TMV	toxicity, mobility, or volume
TPHs	total petroleum hydrocarbons
TRC	Technical Review Committee
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and disposal
UIC	underground injection control
US	Upper Sand
UST	underground storage tank
WHPAs	wellhead protection areas

APPENDIX A

TABLES

Table 1

Summary of Stage 2 and 3 Activities
Site 34, Pease AFB, NH

Date	Activity	Scope	Purpose
10/87-12/87	Soil-gas survey	Around Building 222 based on a 100- by 100-foot grid.	Evaluate soil for presence of VOCs.
3/88-4/88	Soil boring program	Soil borings 753 through 756, 780, and 781. Placement based on previous soil-gas survey.	Evaluate soils in areas of elevated VOCs based on soil-gas survey.
9/88-10/88	Bedrock well installation and development	Monitor well 617.	Evaluate bedrock water-bearing unit beneath the site.
11/88-12/88	Round 1 groundwater sampling	Monitor well 617.	Evaluate groundwater for VOCs, SVOCs, metals, and inorganics.
11/88	Round 1 surface water/sediment sampling	Staff gage 806 (Test Cell Ditch).	Evaluate surface water/sediment for VOCs, SVOCs, TPHs, cyanide, and metals.[a]
5/89	Round 2 surface water sampling	Staff gage 806 (Test Cell Ditch).	Evaluate surface water for VOCs, SVOCs, TPHs, cyanide, and metals.[a]
5/89	Round 2 groundwater sampling	Monitor well 617.	Evaluate groundwater for VOCs, SVOCs, metals, and inorganics.[a]
9/89	Collect effluent discharge sample	Evaluate discharge to Test Cell Ditch from the JETC.	Analyze discharge sample.
6/90	Bedrock well installation and development.	Potential recovery wells 634 and 635.	Installed for possible use as recovery wells for groundwater treatment plant.
6/90	Wetlands delineation	In and adjacent to JETC.	Identify wetlands areas.
7/90	Hydraulic testing	Wells 617, 634, and 635.	Select wells suitable for groundwater recovery system.
9/90	Soil/Sediment Removal IRM	Test Cell Ditch.	Remove contaminated soil/sediment from Test Cell Ditch.
9/90	Test pit excavation	Eleven test pits: 987 through 997.	Soil analyzed for VOCs, SVOCs, TPHs, and cyanide.[b]
10/90	Rounds 1 and 3 groundwater sampling	Round 1 groundwater sampling for wells 634 and 635, and Round 3 for well 617.	Evaluate groundwater for VOCs, SVOCs, TPHs, metals, and total cyanide.[b]

Table 1

Summary of Stage 2 and 3 Activities
Site 34, Pease AFB, NH
(Continued)

Date	Activity	Scope	Purpose
3/91	Installation of pilot GWTP	Site 34 groundwater recovery system (wells 634 and 635).	Recover and treat contaminated groundwater from water-bearing unit beneath Site 34.
5/91-7/91	Surface geophysical surveys	Seismic refraction, very low-frequency electromagnetic, electrical earth resistivity, and terrain conductivity surveys in JETC area.	Map bedrock surface and structure.
6/91	Surface water/sediment sampling	Southern Ditch: 8043 and 8042. Upper Newfields Ditch: 8045 and 8044.	Evaluate surface water/sediment in Upper Newfields and Southern Ditches.[b]
6/91-9/91	Soil boring/sampling program	Fifty-four boreholes: 7153 through 7179, 7181 through 7185, 7187 through 7196, 7200 through 7203, 7216, 7217, and 7240 through 7245.	Use borings to characterize soil contamination, to provide stratigraphic information, and to obtain risk assessment samples.[b]
7/91-9/91	Overburden well installation	Five overburden wells; 5016, 5021, 5027, 5028, and 5029.	Evaluate overburden groundwater quality.
7/91-12/91	Bedrock well installation	Twelve bedrock wells: 6009, 6010, 6011, 6015 through 6020, and 6038 through 6040. One hybrid well: 6041.	Evaluate shallow and deep bedrock groundwater quality.
9/91	Qualitative long-term pumping test	Two bedrock groundwater recovery wells: 634 and 635.	Initial evaluation of water-bearing unit characteristics.
9/91-10/91	Surface water/sediment sampling	Test Cell Ditch: 806, 8063, 8065, and 8067 through 8071. Upper Newfields Ditch: 8064 and 8066.	Evaluate Upper Newfields Ditch, and evaluate western and eastern ends of Test Cell Ditch.[b]
9/91 and 1/92	Rounds 4 and 5 groundwater sampling	Twelve bedrock wells, 5 overburden wells, and 1 hybrid well.	Evaluate groundwater for VOCs, SVOCs, TPHs, metals, and total cyanide.[b]
10/91	Long-term pumping test	One bedrock groundwater recovery well: 634.	Quantitative evaluation of water-bearing unit characteristics.
10/91	Sediment sampling	Six sediment samples: 8083 through 8088.	Evaluate effect of ditch overflow on wetlands soils.[b]

[a]Analysis methods per the Stage 2 QAPP (F-450).
[b]Analysis methods per the Stage 3 QAPP (F-456).

Table 2

Chemicals of Concern in Soil (0 to 2 feet)[a]
Site 34, Pease AFB, NH

Chemical	Frequency of Detection[b]	Range of Sample Quantitation Limits (mg/kg)	Range of Averaged (Detected) Concentrations[c] (mg/kg)	Mean Concentration[d] (mg/kg)	Upper 95% Confidence Limit of the Mean (mg/kg)
Organics					
Benzoic acid	2/5	1.7-1.8	0.051-0.17	0.56[e]	0.96[e]
Dibenzofuran	1/5	0.33-0.36	0.040	0.15[e]	0.20[e]
Diethyl phthalate	1/5	0.33-0.36	0.043	0.15[e]	0.20[e]
Dimethyl phthalate	1/5	0.33-0.36	0.048	0.15[e]	0.20[e]
Ethylbenzene	1/10	0.005-0.006	21	2.1	6.0
n-Nitrosodiphenylamine	1/5	0.33-0.36	0.045	0.15[e]	0.20[e]
PAHs					
Anthracene	1/5	0.34-0.38	0.20	0.18	0.19
Benzo(a)anthracene	4/5	0.36	0.060-1.9	0.51	1.3
Benzo(a)pyrene	4/5	0.36	0.051-1.6	0.44	1.1
Benzo(b)fluoranthene	4/5	0.36	0.055-1.5	0.44	1.0
Benzo(g,h,i)perylene	3/5	0.36	0.10-0.95	0.30	0.65
Benzo(k)fluoranthene	4/5	0.36	0.052-1.8	0.49	1.2
Chrysene	4/5	0.36	0.079-2.1	0.56	1.4
Fluoranthene	4/5	0.36	0.15-3.4	0.90	2.2
Indeno(1,2,3-cd)pyrene	3/5	0.36	0.092-1.1	0.33	0.74
Phenanthrene	4/5	0.36	0.044-0.85	0.26	0.58
Pyrene	4/5	0.36	0.083-1.6	0.47	1.1
Pentachlorophenol	1/5	1.7-1.9	0.090	0.74[e]	1.1[e]
Xylenes (total)	1/10	0.005-0.006	36	3.6	10
Inorganics					
Barium	7/8	19	23-338	91	161
Lead	7/8	22	7-149	48	78

[a]The listed chemicals were selected as chemicals for both the human health and ecological risk assessments.
[b]Number of sampling locations at which the chemical was detected compared with the total number of sampling locations.
[c]The range of averaged concentrations was the same as the range of detected concentrations.
[d]Arithmetic mean.
[e]Exceeds the maximum detected/averaged concentration.

Table 3

Chemicals of Concern in Soil (0 to 15 feet)[a]
Site 34, Pease AFB, NH

Chemical	Frequency of Detection[b]	Range of Sample Quantitation Limits (mg/kg)	Range of Averaged (Detected) Concentrations[c] (mg/kg)	Mean Concentration[d] (mg/kg)	Upper 95% Confidence Limit of the Mean (mg/kg)
Organics					
Benzene	3/36	0.005-5.0	0.035(0.004)-0.36(0.16)	0.14	0.22
Benzoic acid	2/20	0.58-19	0.43(0.051)-0.56(0.17)	1.5[e]	2.1[e]
2-Butanone	3/35	0.005-7.3	0.006-3.0(9.0)	0.33	0.51
Dibenzofuran	4/20	0.32-3.8	0.12(0.040)-0.41	0.24	0.31
Diethyl ether	5/36	0.005-2.8	0.003(0.001)-1.2(2.4)	0.48	0.83
Di-n-butyl phthalate	4/20	0.32-3.8	0.037-0.092	0.29[e]	0.41[e]
Ethylbenzene	8/36	0.005-0.74	1.5(0.018)-28	2.3	3.9
2-Methylnaphthalene	9/20	0.32-0.41	0.14(0.59)-11	1.3	2.4
Naphthalene	6/20	0.32-0.41	0.14-7.6	1.1	1.9
PAHs					
Acenaphthene	3/20	0.32-3.8	0.17-0.28	0.23	0.30[e]
Anthracene	9/20	0.32-0.42	0.038-1.9	0.31	0.47
Benzo(a)anthracene	11/20	0.32-0.42	0.047-1.9	0.37	0.54
Benzo(a)pyrene	11/20	0.32-0.42	0.049(0.047)-1.9	0.31	0.47
Benzo(b)fluoranthene	10/20	0.32-1.9	0.062(0.055)-1.9	0.35	0.51
Benzo(g,h,i)perylene	7/20	0.32-3.8	0.042-0.57(0.95)	0.23	0.31
Benzo(k)fluoranthene	11/20	0.32-0.42	0.055(0.040)-1.9	0.31	0.48
Chrysene	11/20	0.32-0.42	0.062-1.9(2.1)	0.37	0.54
Dibenzo(a,h)anthracene	2/20	0.32-3.8	0.059-0.14	0.26[e]	0.35[e]
Fluoranthene	12/20	0.32-0.41	0.061-2.4(3.4)	0.58	0.85
Fluorene	4/19	0.32-0.42	0.27-1.9	0.32	0.47
Indeno(1,2,3-cd)pyrene	7/20	0.32-3.8	0.037-0.65(1.1)	0.23	0.31
Phenanthrene	11/20	0.32-0.41	0.11(0.044)-3.1	0.56	0.86
Pyrene	12/20	0.32-0.41	0.060-2.3	0.43	0.62
Toluene	4/36	0.005-5.0	0.14(0.002)-4.9	0.27	0.51
Xylenes (total)	8/33	0.005-0.74	5.0(0.025)-140	10	18
Inorganics					
Antimony	3/11	13-21	14.4(10.8)-20.7	11	14
Arsenic	14/14	1.0[f]	4.1(2.0)-34.0	12	15
Barium	13/14	22	12-202	50	73
Chromium	13/14	4.0[f]	6.0(4.9)-63.5(72.3)	21	29

Table 3

Chemicals of Concern in Soil (0 to 15 feet)[a]
Site 34, Pease AFB, NH
(Continued)

Chemical	Frequency of Detection[b]	Range of Sample Quantitation Limits (mg/kg)	Range of Averaged (Detected) Concentrations[c] (mg/kg)	Mean Concentration[d] (mg/kg)	Upper 95% Confidence Limit of the Mean (mg/kg)
Inorganics (continued)					
Lead	12/14	20-21	6.9(3.1)-100(149)	24	36
Nickel	14/14	5.0[f]	7.8(6.1)-70.7(91.4)	21	29

[a]The listed chemicals were selected as chemicals of concern for both the human health and ecological risk assessments.
[b]Number of sampling locations at which the chemical was detected compared with the total number of sampling locations.
[c]If the minimum or maximum detected concentration differed from the respective minimum or maximum averaged concentration, the detected concentration is given in parentheses.
[d]Arithmetic mean.
[e]Exceeds the maximum detected and/or averaged concentrations.
[f]Sample quantitation limits were unavailable. Method detection limit is indicated.

Table 4

Summary of Total Lifetime Cancer Risks and Hazard Indices
Site 34, Pease AFB, NH

		Total Lifetime Cancer Risk[a,b]			Total Hazard Index[a,c]		
Medium	RME	Mean	Upper 95% Confidence Limit	Maximum	Mean	Upper 95% Confidence Limit	Maximum
Soil (0 to 2 feet)	Current maintenance worker	8E-07	2E-06	3E-06	1E-03	2E-03	4E-03
	Future maintenance worker	4E-06	1E-05	2E-05	7E-03	1E-02	2E-02
Soil (0 to 15 feet)	Future maintenance worker	3E-06	5E-06	2E-05	1E-02	2E-02	5E-02

[a]Values are rounded to one significant number.
[b]Maximum cancer risk at hazardous waste sites is usually regulated in the range of 1E-06 to 1E-04 (10^{-6} to 10^{-4}). Risks of less than 1E-06 (10^{-6}) are generally not considered to be of concern.
[c]A hazard index of 1 (1E+00) or greater is usually considered the benchmark of potential concern.

Table 5

Summary of Detailed Alternatives Evaluation[a]
Site 34, Pease AFB, NH

Remedial Alternative	Short-Term Effectiveness Ranking	Long-Term Effectiveness Ranking	Reduction in TMV Ranking	Implementability Ranking	Protection of Human Health and Environment Ranking	Compliance with ARARs Ranking	Cost Analysis[b] (sensitivity analysis)[c]
1. No Action/Institutional Controls	AB	C	C	A	C	BC	$367,000
2A. In Situ Soil Aerobic Biological Treatment with SVE, and On-Site Groundwater Extraction and Treatment with On- and Off-Site Disposal	AB	AB	AB	AB	AB	A	$2,534,000 ($2,252,319 to $2,944,792)
3A. Excavation and On-Site Ex Situ Biological/Vapor Extraction Treatment of Contaminated Soil and On-Site Disposal, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	B	AB	AB	AB	AB	A	$1,735,000 ($1,662,196 to $1,902,248)
4. Excavation and On-Site Thermal Desorption of Contaminated Soil and On-Site Disposal, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	B	AB	AB	AB	AB	A	$3,512,000 ($3,115,673 to $4,275,882)
5A. Excavation and Off-Site Treatment and/or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering	AB	AB	AB	AB	B	A	$1,614,000 ($1,499,757 to $1,861,354)

[a]The letter ranking system is described in Subsection 5.3 of the Draft Final Site 34 FS Report. The ranking worksheet may be found in Appendix I of the Draft Final Site 34 FS Report.
[b]Estimated costs represent the 30-year present-worth cost. Detailed cost estimates are presented in Appendix E of the Draft Final Site 34 FS Report.
[c]The sensitivity analysis costs represent the upper and lower limits of the 50% confidence interval.

Table 6

Risk-Based Concentrations for Groundwater
Site 34, Pease AFB, NH

Chemical	Based on Noncancer Hazard Index (mg/L)	Based on Cancer Risk (mg/L)
Benzene*	—	1.47E-03
Benzoic acid	1.46E+02	—
Bis(2-ethylhexyl) phthalate	—	6.08E-03
2-Butanone	1.83E+00	—
Chlorobenzene*	1.62E-01	—
Dibenzofuran	1.46E-01	—
Diethyl ether*	3.65E+00	—
Diethyl phthalate	2.92E+01	—
Dimethyl phthalate	3.65E+02	—
Di-n-butyl phthalate	3.65E+00	—
Ethylbenzene*	2.70E+00	—
2-Methylnaphthalene*	1.34E-02	—
Naphthalene*	1.34E-02	—
n-Nitrosodiphenylamine*	—	8.69E-03
PAHs		
Acenaphthene	2.19E+00	—
Anthracene*	1.35E-02	—
Benzo(a)anthracene	—	1.17E-05
Benzo(b)fluoranthene	—	1.17E-05
Benzo(k)fluoranthene	—	1.17E-05
Benzo(g,h,i)perylene	1.46E+00	—
Benzo(a)pyrene	—	1.17E-05
Chrysene	—	1.17E-05
Dibenzo(a,h)anthracene	—	1.17E-05
Fluoranthene	1.46E+00	—
Fluorene	1.46E+00	—
Indeno(1,2,3-cd)pyrene	—	1.17E-05
Phenanthrene*	1.34E-02	—
Pyrene	1.10E+00	—
Pentachlorophenol	—	7.10E-04
Toluene*	2.65E+00	—
1,1,1-Trichloroethane*	2.53E+00	—
Trichlorofluoromethane*	4.38E+00	—
Xylenes (total)*	3.65E+01	—

*Henry's Law constant for the chemical was greater than 1E-04 atm-m^3/mole (F-123; F-142; F-257; F-260; F-382). Therefore, both groundwater ingestion and noningestion household uses were considered in determining the risk-based concentration.

Table 7

Selection of Groundwater Cleanup Goals for Application of Leaching Model — Organics in Groundwater Site 34, Pease AFB, NH

Chemical	MCL[a] (mg/L)	MCLG[b] (mg/L)	NHDPHS Advisory Level[c] (mg/L)	Lifetime Health Advisory	Risk-Based Concentrations: Based on Noncancer Hazard[d] (mg/L)	Risk-Based Concentrations: Based on Cancer Risk[e] (mg/L)	Groundwater Cleanup Goal Selected for Leaching Model (mg/L)
Benzene	0.005*	0	0.005			0.00147	0.005
Benzoic acid			28.0*		146.0		28
Bis(2-ethylhexyl) phthalate	0.006*	0	0.006		0.73	0.00608	0.006
2-Butanone			0.17*	0.2	1.83		0.17
Chlorobenzene	0.1*	0.1	0.1	0.1	0.146		0.1
Dibenzofuran					0.146		0.146
Diethyl ether					3.65*		3.65
Diethyl phthalate				5.0*	29.2		5 0
Dimethyl phthalate					365		365
Di-n-butyl phthalate			34*		3.65		34
Ethylbenzene	0.7*	0.7	0.7	0.7	2.7		0.7
2-Methylnaphthalene					0.0134*		0.0134
Naphthalene			0.02*	0.02	0.0134		0.02
n-Nitrosodiphenylamine					0.365	0.00869*	0.00869
PAHs							
Acenaphthene					2.19*		2.19

Table 7

Selection of Groundwater Cleanup Goals for Application of Leaching Model — Organics in Groundwater Site 34, Pease AFB, NH (Continued)

Chemical	MCL[a] (mg/L)	MCLG[b] (mg/L)	NHDPHS Advisory Level[c] (mg/L)	Lifetime Health Advisory	Risk-Based Concentrations: Based on Noncancer Hazard[d] (mg/L)	Risk-Based Concentrations: Based on Cancer Risk[e] (mg/L)	Groundwater Cleanup Goal Selected for Leaching Model (mg/L)
Anthracene					0.0134*		0.0134
Benzo(a)anthracene	0.0001 P*	0 P				1.17E-05	0.0001
Benzo(b)fluoranthene	0.0002 P*	0 P				1.17E-05	0.0002
Benzo(k)fluoranthene	0.0002 P*	0 P				1.17E-05	0.0002
Benzo(g,h,i)perylene					1.46*		1.46
Benzo(a)pyrene	0.0002 P*	0 P	3.0 + E-06			1.17E-05	0.0002
Chrysene	0.0002 P*	0 P				1.17E-05	0.0002
Dibenzo(a,h)anthracene	0.0003 P*	0 P				1.17E-05	0.0003
Fluoranthene					1.46*		0.166[f]
Fluorene					1.46*		1.46
Indeno(1,2,3-cd)pyrene	0.0004 P*	0 P	0			1.17E-05	0.0004
Phenanthrene					0.0134*		0.0134
Pyrene					1.10*		0.135[f]
Pentachlorophenol	0.001 P*	0 P	0.001		1.10	7.1E-04	0.001
Toluene	1.0*	1.0	1.0	1.0	2.65		1.0
1,1,1-Trichloroethane	0.2*	0.2	0.2	0.2	2.53		0.2

Table 7

Selection of Groundwater Cleanup Goals for Application of Leaching Model — Organics in Groundwater Site 34, Pease AFB, NH (Continued)

Chemical	MCL[a] (mg/L)	MCLG[b] (mg/L)	NHDPHS Advisory Level[c] (mg/L)	Lifetime Health Advisory	Risk-Based Concentrations: Based on Noncancer Hazard[d] (mg/L)	Risk-Based Concentrations: Based on Cancer Risk[e] (mg/L)	Groundwater Cleanup Goal Selected for Leaching Model (mg/L)
Trichlorofluoromethane				2.0•	4.38		2.0
Xylenes (total)	10.0•	10.0	10.0	10.0	36.5		10.0

[a]Maximum Contaminant Level, March 1991.
[b]Maximum Contaminant Level Goal, March 1991.
[c]New Hampshire Department of Public Health Services, June 1992.
[d]Developed based on noncancer hazard index of 1 and the exposure scenarios discussed in Subsection 2.3 of the Draft Final Site 34 FS Report.
[e]Developed based on 10^{-6} cancer risk and the exposure scenarios discussed in Subsection 2.3 of the Draft Final Site 34 FS Report.
[f]This value would have been used except the concentration was above the solubility of the compound; therefore, the solubility value was used in the model.
NTV = No available applicable toxicity value.
P = Proposed standard.
•Value used for model input.

Table 8

Selection of Cleanup Goals for Organics in Soil
Site 34, Pease AFB, NH

Organic Chemical	ARARs RCRA[a] (mg/kg)	ARARs New Hampshire[b] (mg/kg)	Target Level Based on Leaching[c] (Unsaturated) (mg/kg)	Maximum Concentration Detected[c] (mg/kg)	Preliminary Cleanup Goal (mg/kg)
Benzene		1.0[de]	4.1	0.16	1.0[d]
Benzoic acid			55,259	0.17	NA
Bis(2-ethylhexyl) phthalate	50		5,921	0.14	NA
2-Butanone	4,000		6.5	9.0	NA[f]
Chlorobenzene	2,000		326.0	1.2	NA
Dibenzofuran			15,127	0.41	NA
Diethyl ether			249	2.4	NA
Diethyl phthalate	60,000		19,881	0.043	NA
Dimethyl phthalate			360,170	0.048	NA
Di-n-butyl phthalate			49,703	0.098	NA
Ethylbenzene	8,000	1.0[de]	7,598	28.0	1.0[d]
2-Methylnaphthalene			727	11.0	NA
Naphthalene			186	7.6	NA
n-Nitrosodiphenylamine	100		49	0.045	NA
PAHs					
Acenaphthene			99,407	0.28	NA
Anthracene			3,438	1.9	NA
Benzo(a)anthracene			1,381	1.9	NA
Benzo(b)fluoranthene			1,085	1.9	NA
Benzo(k)fluoranthene			8,684	1.9	NA
Benzo(g,h,i)perylene			20,012	0.95	NA
Benzo(a)pyrene			10,854	1.9	NA
Chrysene			395	2.1	NA
Dibenzo(a,h)anthracene			9,769	0.14	NA
Fluoranthene			62,245	3.4	NA
Fluorene			72,034	1.9	NA
Indeno(1,2,3-cd)pyrene			6,315	1.1	NA

Table 8

Selection of Cleanup Goals for Organics in Soil
Site 34, Pease AFB, NH
(Continued)

Organic Chemical	ARARs: RCRA[a] (mg/kg)	ARARs: New Hampshire[b] (mg/kg)	Target Level Based on Leaching[c] (Unsaturated) (mg/kg)	Maximum Concentration Detected[e] (mg/kg)	Preliminary Cleanup Goal (mg/kg)
Phenanthrene			2,446	3.1	NA
Pyrene			111,899	2.3	NA
Pentachlorophenol	2,000		118	0.09	NA
Toluene	20,000	1.0[d]•	2,467	4.9	1.0[d]
1,1,1-Trichloroethane	7,000		300	0.6	NA
Trichloroflouromethane			3,138	0.002	NA
Xylenes (total)	200,000	1.0[d]•	26,445	140.0	1.0[d]

[a]Soil values from RCRA Corrective Action Levels, 1990.
[b]State of New Hampshire Interim Policy for the Management of Soils Contaminated from Spills/Releases of Virgin Petroleum Products, 1991.
[c]Soil concentration developed from leaching model as discussed in Subsection 2.4 and Appendix B of the Draft Final Site 34 FS Report.
[d]Represents 1.0 mg/kg total BTEX (benzene, toluene, ethylbenzene, and xylene).
[e]Maximum as presented in the Draft Final Site 34 RI Report.
[f]Maximum detected concentration was not considered to be representative of conditions at the site. All other samples were nondetect for this compound; therefore, no cleanup goal was selected.
•Value used to select cleanup goal, if applicable.
NA = Not applicable. ARARs and risk-based concentrations exceed maximum detected concentrations.

Table 9

Cancer Risks and Hazard Indices Calculated Based on ARARs — Soil Site 34, Pease AFB, NH

Chemical	ARAR (mg/kg)	Hazard Index	Cancer Risk
Benzene	1.00E+00	--	2.66E-08
Ethylbenzene	1.00E+00	2.57E-05	--
Toluene	1.00E+00	1.28E-05	--
Xylene	1.00E+00	1.28E-06	--

Table 10

Groundwater Treatment Goals For Excavation Dewatering
Site 34, Pease AFB, NH

Parameter	Potential ARARs (μg/L)					Maximum Concentration Detected	Treatment Goal
	MCL	MCLG	NHDPHS Advisory Level	RCRA	Lifetime Health Advisory		
ORGANICS							
Benzene	5[a]	0	5			1,100	5
bis(2-Ethylhexyl) phthalate	6[a]	0	6	3		720	6
N-Butylbenzene						40	NA
sec-Butylbenzene						17	7.3[b]
tert-Butylbenzene						3	NA
Chlorobenzene	100	100	100	700		0.1 J	NA
1,2-Dichlorobenzene	600	600	600		600	0.2 J	NA
1,4-Dichlorobenzene	75	75	75		75	0.1 J	NA
1,1-Dichloroethane			81			0.3 J	NA
1,1-Dichloroethene	7	7	7	7	7	0.8 J	NA
cis-1,2-Dichloroethene	70[a]	70	70		70	90 J	70
trans-1,2-Dichloroethene	100	100	100		100	5	NA
2,4-Dimethylphenol						7 J	NA
Dimethylphthalate						12	NA
Ethylbenzene	700[a]	700	700	4,000	700	800	700
Isopropylbenzene						80	NA
4-Isopropyltoluene						24	NA

Table 10

Groundwater Treatment Goals For Excavation Dewatering
Site 34, Pease AFB, NH
(Continued)

Parameter	Potential ARARs (µg/L)					Maximum Concentration Detected	Treatment Goal
	MCL	MCLG	NHDPHS Advisory Level	RCRA	Lifetime Health Advisory		
2-Methylnaphthalene						37	12.4[b]
Naphthalene			20[c]		20	110	20
PAHs							
Fluorene						1 J	NA
Phenanthrene						2 J	NA
Pentachlorophenol	1[c]	0	1	1,000		6 J	NA
Phenol			4,000	20,000	4,000	5 J	NA
N-Propylbenzene						100	NA
Tetrachloroethene	5	0	5	0.7		0.4 J	NA
Toluene	1,000	1,000	1,000	10,000	1,000	20	NA
1,2,3-Trichlorobenzene				700		1	NA
1,2,4-Trichlorobenzene	70	70	9[e]	700	70	0.5 J	NA
1,1,1-Trichloroethane	200	200	200	3000	200	0.5 J	NA
Trichloroethene	5[c]	0	5	5		32	5
Trichlorofluoromethane				10,000	2,000	0.2 J	NA
1,2,4-Trimethylbenzene						590	19.8[b]
1,3,5-Trimethylbenzene						140	NA

Table 10

Groundwater Treatment Goals For Excavation Dewatering
Site 34, Pease AFB, NH
(Continued)

Parameter	Potential ARARs (µg/L)					Maximum Concentration Detected	Treatment Goal
	MCL	MCLG	NHDPHS Advisory Level	RCRA	Lifetime Health Advisory		
Xylenes (total)	10,000	10,000	10,000	70,000	10,000	1,940	NA
INORGANICS							
Aluminum			50 - 200[c*]			27,000	200
Arsenic	50[*]	50[*]	50	50		109	50
Barium	2,000	2,000	2,000	1,000	2,000	349	NA
Boron			620		600	283	NA
Cadmium	5[*]	5	5	10	5	8.6	5
Calcium						110,000	NA
Chromium	100[*]	100	100	50	100	56.4	NA
Cobalt						56.7	NA
Iron			300[*]			47,900	300
Lead	15[*]	0	15	50		23.1[d]	15
Magnesium						39,500	NA
Manganese		200	50[c*]			8,480	50
Mercury	2	2	2	2	2	0.465	NA
Nickel	100	100	100	700	100	54.2	NA
Potassium						92,600	NA

Table 10

Groundwater Treatment Goals For Excavation Dewatering
Site 34, Pease AFB, NH
(Continued)

Parameter	Potential ARARs (µg/L)					Maximum Concentration Detected	Treatment Goal
	MCL	MCLG	NHDPHS Advisory Level	RCRA	Lifetime Health Advisory		
Silicon						32,600	NA
Sodium			100,000 - 250,000[c]			110,000	NA
Zinc			5,000		2,000	107	NA

NOTES

All values are in µg/L.
Only detected parameters are shown in the table.
[a]Proposed standard.
[b]Value reported is concentration derived from baseline risk assessment for Site 34.
[c]SDWA or NH SMCL.
[d]An estimated concentration (58.4J) for lead was reported for well 6009 from the October 1991 sampling round. This concentration is considered invalid; nondetects for lead were reported in a duplicate sample and a subsequent (January 1992) sample from well 6009.
NA = Not applicable. Concentrations detected are below ARARs and risk-based concentrations, or no toxicity value or ARAR available.
[e]Value chosen as treatment goal.
Maximum concentrations of both total and soluble concentrations.

Table 11

ARARs for Alternative 5A - Excavation and Off-Site Treatment And/Or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering
Site 34, Pease AFB, NH

Media	Requirement	Requirement Synopsis	Action To Be Taken To Attain Requirements	Status
	Chemical-Specific			
Soil	FEDERAL-EPA Health Advisories (HAs)	HAs are nonenforceable health-based standards established for various exposure durations (i.e., 1-day, 10-day, and lifetime).	HAs have been considered when selecting groundwater treatment levels as presented in Tables 2.5-4 and 2.5-5 of the Site 34 FS Report.	TBC
Soil	FEDERAL-EPA Risk Reference Doses (RfDs)	RfDs are dose levels developed based on the noncarcinogenic effects and are used to develop hazard indices. A hazard index of <1 is considered acceptable.	EPA RfDs have been used to characterize risks resulting from exposure to contaminants in groundwater, as leaching from soils to groundwater may potentially occur.	TBC
Soil	FEDERAL-EPA Carcinogen Assessment Group Potency Factors	Potency Factors are developed by the EPA from health effects assessments or evaluation by the Carcinogenic Assessment Group and are used to develop excess cancer risks. A range of 10^{-4} to 10^{-6} is considered acceptable.	EPA Carcinogenic Potency Factors have been used to compute the individual incremental cancer risk resulting from exposure to site contamination in groundwater. Soil risk levels have been found to be $<10^{-6}$. Surface water and sediment will be evaluated in Zone 3 FS Report.	TBC
	Location-Specific			
Floodplains	Floodplains Executive Order (EO 11888)	Federal Agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial value of floodplains.	No floodplain has been identified. Moreover, work to be done under remedial action would not permanently affect any floodplain which may be identified.	Applicable

Table 11

ARARs for Alternative 5A - Excavation and Off-Site Treatment And/Or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering
Site 34, Pease AFB, NH
(Continued)

Media	Requirement	Requirement Synopsis	Action To Be Taken To Attain Requirements	Status
Wetlands	Wetlands Executive Order (EO 11990)	Under this order, federal agencies are required to minimize the destruction, loss or degradation of wetlands, and beneficial values of wetlands.	The Remedial Action will address impacts to identified wetlands. Remedial activities will minimize harm to the wetlands to the extent possible.	Applicable
Wetlands	FEDERAL-CWA 404, Section 404(b)(l) Guidelines for Specification of Disposal Sites for Dredged or Fill Material 40 CFR Part 230	Contains requirements for discharge of dredge or fill material, including that no discharge is permitted if there is a practicable alternative to the proposed discharge which would have a less adverse impact on the aquatic ecosystem, and that no discharge permitted unless appropriate and practicable steps are taken to minimize potential adverse impacts on the aquatic ecosystem.	The range of alternatives evaluated were those which best meet the project purpose of minimizing leaching of contaminants from source area soils into groundwater and surface water. All of the alternatives have similar adverse impacts on the Site 34 wetlands. However, the selected alternative had the least adverse impact. Remedial activities will be designed to minimize potential adverse affects on the aquatic ecosystem. Any wetlands adversely affected will be restored or replaced.	Applicable
Wetlands, Rivers	FEDERAL-16 USC 661 et. seq., Fish and Wildlife Coordination Act	Requires Federal agencies to take into consideration the effect that water-related projects will have upon fish and wildlife. Requires consultation with Fish and Wildlife Service and the State to develop measures to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Relevant federal agencies will be contacted to help analyze effects of remedial action on wildlife in the wetlands in and around Site 34 and to develop measures to prevent, mitigate, and compensate for adverse impacts.	Applicable

Table 11

ARARs for Alternative 5A - Excavation and Off-Site Treatment And/Or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering Site 34, Pease AFB, NH (Continued)

Media	Requirement	Requirement Synopsis	Action To Be Taken To Attain Requirements	Status
Wetlands, Rivers	STATE-RSA 485:A-17 NH Admin. Code Env-Ws 415, Rules Relative to Prevention of Pollution from Dredging, Filling, Mining, Transporting, Construction	Establish criteria for conducting any activity in or near state surface waters which significantly alters terrain or may otherwise adversely affect water quality. Impede natural runoff or create unnatural runoff. Activities within the scope of these provisions include excavation, dredging, filling, mining and grading of topsoil in or near wetland areas.	Soil excavation and groundwater treatment will meet substantive requirements of these NHDES rules prior to initiation of activities in the wetlands or vicinity of the Test Cell Ditch.	Applicable
Wetlands, Rivers	STATE-RSA 482-A, NH Admin. Code Env-Wt 300, 400, 600, New Hampshire Criteria and Conditions for Fill and Dredging in Wetlands	Regulate filling and other activities in or adjacent to wetlands, and establish criteria for the protection of wetlands from adverse impacts on fish, wildlife, commerce and public recreation.	Proposed work adjacent to the wetlands and Test Cell Ditch will comply with State wetland protection requirements.	Applicable
	<u>Action-Specific</u>			
Water	FEDERAL-CWA 40 CFR Part 403 EPA Pretreatment Standard	General guidelines to be followed in establishing pretreatment effluent discharges limits for pollutants that will be discharged to a POTW.	Discharge to wastewater treatment plant will meet pretreatment requirements of CWA.	Applicable
Soils	CERCLA Off-Site Disposal Policy - OSWER Directive 9834.11, 11/13/87	This policy requires off-site receiving facility to be in compliance with all permit and with applicable state and federal requirements.	The off-site receiving facility will have to be licensed and in compliance with permits and applicable state and federal requirements before any material from Site 34 is taken to the facility.	TBC
	STATE-NH Admin. Code Env-Wm 702.06, Public Notification Plan	General requirement for owner or operator to develop a community relations plan at the request of NHDES.	Community relations plan is being developed.	Applicable

Table 11

ARARs for Alternative 5A - Excavation and Off-Site Treatment And/Or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering Site 34, Pease AFB, NH (Continued)

Media	Requirement	Requirement Synopsis	Action To Be Taken To Attain Requirements	Status
Soils	STATE-NH Admin. Code Env-Ws 411, Control of Underground Storage Facilities	Establishes requirements for the installation, permitting, testing, operation, maintenance, and closure of USTs.	The closure of the USTs will comply with applicable sections of these regulations.	Applicable
Soils	STATE-NH Admin. Code Env-Ws 412, Reporting and Remediation of Oil Discharges	Establishes procedures and requirements for notification, reporting, response actions, and investigations for sites where discharges of oil have occurred.	The requirements of this regulation have been used in the development of the remedial alternatives.	Relevant & Appropriate
Water	STATE-NH Admin. Code Env-Ws 904, Standards For Pretreatment of Wastes Prior to Discharge to POTW	Establishes pretreatment standards for wastewaters discharged to POTW. Specific prohibited wastes are also identified.	These regulations, along with all pretreatment requirements imposed by the wastewater treatment plant, will be met for discharges to the sewer system. Treatment goals for groundwater are presented in Tables 2.5-4 and 2.5-5 of the Site 34 FS Report.	Applicable
Water	STATE-NH Admin. Code Env-Wr 700, Water Resources	Establishes requirements for users of 20,000 gallons of water or more over 7-day period or 600,000 gallons in any 30-day period. The requirements include registration, measurement, and reporting.	The groundwater treatment system will comply with the water use requirements.	Applicable
Air	STATE-NH Admin. Code Env-A 800 Testing and Monitoring Procedures	Identifies procedures that must be followed for testing of air emissions from stationary sources.	During groundwater treatment, and soil excavations, air emissions will be monitored and tested to ensure that these sources do not exceed applicable standards.	Applicable
Air	STATE-NH Admin. Code Env-A 1300 Toxic Air Pollutants	Standards established to protect the public from concentrations of pollutants in ambient air that may cause adverse health effects.	Release of contaminants to the air from any on-site remedial action will not result in exceedence of the respective Ambient Air Limit, if one exists.	Applicable

Table 11

ARARs for Alternative 5A - Excavation and Off-Site Treatment And/Or Disposal of Contaminated Soil, and On-Site Groundwater Treatment and Off-Site Disposal for Excavation Dewatering
Site 34, Pease AFB, NH
(Continued)

Media	Requirement	Requirement Synopsis	Action To Be Taken To Attain Requirements	Status
Air	STATE-NH Admin. Code Env-A 300 Ambient Air Standards	Establishes primary and secondary levels for eight air contaminants (particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, hydrocarbons, fluorides, and lead).	These ambient air levels will be incorporated with federal NAAQs to establish target levels, that may not be exceeded in air emissions from on-site activities, including soil excavation and groundwater treatment. Air monitoring will be conducted during remedial activities.	Applicable
Air	STATE-NH Admin. Code Env-1002 Fugitive Dust Control	Requires precautions to prevent, abate, and control fugitive dust during specified activities, including excavation, construction, and bulk hauling.	Precautions to control fugitive dust emissions will be required during remedial activities. These precautions will be included in remedial design.	Applicable
Soils	STATE-NH Guidance Document, Interim Policy for the Management of Soils Contaminated from Spills/Releases of Virgin Petroleum Products.	This policy identifies options for treatment and disposal, current analytical methods, and remediation goals for virgin petroleum-contaminated soils.	Requirements will be attainted via excavation, off-site treatment and disposal. Soil cleanup goals are presented in Table 2.5-1 of the Site 34 FS Report.	TBC

APPENDIX B

ARARS FOR PEASE AFB

APPENDIX B

ARARs FOR SITE 34

2.2 ENVIRONMENTAL AND PUBLIC HEALTH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

SARA and the NCP, revised 8 March 1990 [40 Code of Federal Regulations (CFR) 300], provide that the development and evaluation of remedial actions under CERCLA must include a comparison of alternative site responses to federal and state environmental and public health ARARs. The following subsections present and discuss ARARs and other *to be considered* (TBC) criteria that may affect remediation at Site 34. A list of ARARs appropriate to the preferred alternative selected for detailed evaluation at Site 34 is presented in Table 11, in Appendix A. B

2.2.1 Identification of ARARs

Identification of ARARs must be performed on a site-specific basis. NCP and SARA do not provide universal standards for determining whether a particular remedial action will produce an adequate remedy at a particular site. Rather, the process recognizes that each site has unique characteristics that must be evaluated and compared to those requirements that apply under the given circumstances. ARARs are defined as follows:

- Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, or local laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

- Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, or local laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site.

- TBC information refers to other federal and state criteria, advisories, guidance, and proposed standards and local ordinances that are not legally binding, but that may provide useful information or recommended procedures.

ARARs may be divided into the following categories:

- Chemical-specific requirements are health- or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. These limits may take the form of action levels or discharge levels.

- Location-specific requirements are restrictions on activities based on the characteristics of a site or its immediate environment. An example is restrictions on wetlands development.

- Action-specific requirements are controls or restrictions on particular types of activities in related areas such as hazardous waste management or wastewater treatment. An example is Resource Conservation and Recovery Act (RCRA) incineration standards. Because such requirements are triggered by the particular remedial alternative action considered, and the FS evaluates a wide range of alternative actions, many different action-specific requirements may be applicable.

The chemical-, location-, and action-specific ARARs for Site 34 are summarized in Table 2.2-1.

2.2.2 Chemical-Specific ARARs

Chemical-specific requirements "set health- or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants" (52 FR 32496). These requirements generally set protective cleanup levels for the chemicals of concern in the designated media, or indicate a safe level of release that may be incorporated into a remedial activity.

Table 2.2-1

ARARs for Site 34
Pease AFB, NH

- Chemical-Specific ARARs
  - Clean Water Act (CWA)
  - Clean Air Act (CAA)
  - State of New Hampshire Regulations
- Location-Specific ARARs
  - Fish and Wildlife Coordination Act (FWCA)
  - State of New Hampshire Regulations
- Action-Specific ARARs
  - Hazardous Materials Transportation Act (HMTA)
  - Occupational Safety and Health Act (OSHA)
  - CWA
  - CAA
  - State of New Hampshire Regulations
- To Be Considered (TBCs) Criteria
  - EPA Health Advisories (HAs)
  - EPA Risk Reference Doses (RfDs)
  - EPA Carcinogen Assessment Group Potency Factors
  - NH Interim Policy for the Management of Soils Contaminated From Spills/Releases of Virgin Petroleum Products

Clean Water Act

The provisions of CERCLA Section 121 state that remedial actions shall attain federal water quality criteria where they are relevant and appropriate. Federal water quality criteria documents have been published for 65 pollutants or groups of pollutants listed as toxic under the CWA. These criteria are unenforceable TBC guidelines that may be used by states to set surface water quality standards. Although these criteria were intended to represent a reasonable estimate of pollutant concentrations consistent with the maintenance of designated water uses, states may appropriately modify these values to reflect local conditions.

The water quality criteria are generally represented in categories that are aligned with different surface water use designations. Most aquatic life that exhibits levels below specified concentrations is protected against acute or chronic effects (24-hour average). Specific criteria have not been established for many chemical compounds because of insufficient data. Table 2.2-2 provides the most recent water quality criteria for the protection of aquatic life and human health.

Clean Air Act

The CAA was enacted to protect and enhance the quality of air resources to protect public health and welfare. The CAA is intended to initiate and accelerate national research and development programs to achieve the prevention and control of air pollution. Under the CAA, federal agencies are to provide technical and financial assistance to state and local governments for the development and execution of their air pollution programs. EPA is the administrator of the CAA and has the responsibility to meet CAA objectives. CAA requirements are potentially applicable to remedial actions that result in air emissions, such as excavation, landfilling, and treatment activities. National Ambient Air Quality Standards are listed in Table 2.2-3.

State of New Hampshire Regulations

Groundwater

Draft New Hampshire Code of Administrative Rules (NHCAR) and Env-Ws 410 Protection of Groundwater. have been developed and the NHCAR is under the public comment period. The NHCAR ruies are not yet enforceable. and Env-Ws 410 has been officially adopted and is enforceable. the State of New Hampshire Department of Environmental Services (NHDES) has consistently applied the requirements .set forth in these proposed rules and, as such, they are TBCs and ARARs, respectively. The chemical-specific requirements of these rules are discussed in Env-Ws 410.03, Groundwater Quality Criteria. and are presented as follows:

- No person shall cause groundwater quality to be altered in any way that would make groundwater unsuitable for use as a source of drinking water.
- No person shall cause groundwater to contain any regulated contaminant at concentrations above the groundwater quality standards adopted under the New Hampshire Revised Statutes, Annotated (RSA) 485-C:6.
- Prior to the adoption of specific groundwater quality standards. no person shall cause groundwater to contain any regulated contaminant in a concentration above the maximum contaminant level established in Env-Ws 310 through 319, or above health advisory levels issued by EPA or the New Hampshire Division of Public Health Services.
- No person shall cause groundwater to exceed surface water quality standards, as established in RSA 485-A and Env-Ws 430 through Env-Ws 439, at a point of discharge of groundwater to the surface water body.
- No person shall cause degradation of groundwater that results in a violation of surface water quality standards, as established in RSA 485-A and Env-Ws 430 through Env-Ws 439, in any surface water body.

Table 2.2-4 presents State of New Hampshire MCLs and MCLGs established in Env-Ws 310 to 319, Drinking Water Quality Standards as well as the advisory levels established by the New Hampshire Division of Public Health and Services (NHDPHS). Regulated SMCLs (established primarily for aesthetic purposes) in Env-Ws 319 are also presented in Table 2.2-4 and will be considered in selecting site-specific groundwater cleanup goals.

Table 2.2-2

Federal Water Quality Criteria for Protection of Human Health and Aquatic Life
Site 34, Pease AFB, NH

Parameter	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life*	
	Water and Fish Ingestion (mg/L)	Fish Consumption Only (mg/L)	Freshwater Acute/Chronic (mg/L)	Marine Acute/Chronic (mg/L)
Acenapthene	--	--	1.7*/0.5*	0.9*/0.7*
Acenaphthylene	--	--	--	3.0x10-01*
Aldrin	1.3x10-07	1.4x10-07	3.0x10-03	1.3x10-03
Antimony and compounds	1.4x10-02	4.3		
Arsenic and compounds	1.8x10-05	1.4x10-04	0.36/0.19	6.9x10-02/3.6x10-02
Arsenic (V) and compounds	--	--	0.85*	2.3*
Barium and compounds	--1	--	--	--
Benzene	1.2x10-03	7.1x10-02	--	--
Beryllium and compounds	--	--	--	--
Cadmium and compounds	--	--	3.9x10-03**/1.1x10-03**	4.3x10-02/9.3x10-03
Carbon tetrachloride	2.5x10-04	4.4x10-03	--	
Chlordane	5.7x10-07	5.9x10-07	2.4x10-03/4.3x10-06	9.0x10-05/4.0x10-06
Chlorinated benzenes	--	--	2.5x10-01*/5.0x10-02*	1.6x10-01*/ 1.3x10-01*
Chlorinated naphthalenes	--	--	1.6*	7.5x10-03*
Chloroalkyl ethers	--	--	2.3x10+02*	--

Table 2.2-2

Federal Water Quality Criteria for Protection of Human Health and Aquatic Life
Site 34, Pease AFB, NH
(Continued)

Parameter	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life[a]	
	Water and Fish Ingestion (mg/L)	Fish Consumption Only (mg/L)	Freshwater Acute/Chronic (mg/L)	Marine Acute/Chronic (mg/L)
Chloroform	5.7x10-03	0.47	--	--
2-Chlorophenol	--	--	4.4	--
Chromium (III) and compounds	--	--	1.7**/0.2**	--
Chromium (VI) and compounds	--	--	1.6x10-02/1.1x10-02	1.1/5.0x10-02
Copper and compounds	--	--	1.8x10-02**/1.2x10-02**	2.9x10-03/2.9x10-03
Cyanides	0.70	220	2.2x10-02/5.2x10-03	1.0x10-03/1.0x10-03
DDT	5.9x10-07	5.9x10-07	1.1x10-03/1.0x10-06	1.3x10-04/1.0x10-06
Dibutyl phthalate	4	154	--	--
Dichlorobenzenes	4x10-01	2.6	1.1*/7.6x10-01*	1.9*
1,2-Dichloroethane	3.8x10-04	9.9x10-02	--	--
Dichloroethenes	--	--	11.6	224
1,1-Dichloroethene	5.7x10-05	3.2x10-03	--	--
2,4-Dichlorophenol	9.3x10-02	0.79	2.0*/0.37*	--
Dieldrin	1.4x10-07	1.4x10-07	2.5x10-03/1.9x10-06	7.1x10-04/1.9x10-06
Diethyl phthalate	23	120	--	--

Table 2.2-2

Federal Water Quality Criteria for Protection of Human Health and Aquatic Life
Site 34, Pease AFB, NH
(Continued)

Parameter	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life*	
	Water and Fish Ingestion (mg/L)	Fish Consumption Only (mg/L)	Freshwater Acute/Chronic (mg/L)	Marine Acute/Chronic (mg/L)
Dimethyl phthalate	313	2,900	--	--
Endosulfan	7.4x10-02	1.6x10-01	2.2x10-04/5.6x10-05	3.4x10-05/8.7x10-06
Endrin	7.6x10-04	8.1x10-04	1.8x1-04/2.3x10-06	3.7x10-05/2.3x10-06
Ethylbenzene	3.1	29	32	4.3x10-01*
Fluoranthene	0.30	0.37	--	--
Fluorides	--	4.0	--	--
Heptachlor	2.1x10-07	2.1x10-07	5.2x10-04/3.8x10-06	5.3x10-05/3.6x10-06
Hexachlorobenzene	7.2x10-07	7.7x10-07	--	--
Hexachlorobutadiene	4.4x10-04	5x10-02	--	--
Lead and compounds (inorganic)	--	--	8.2x10-02/3.2x10-03**	0.22/8.5x10-03
Mercury and compounds (alkyl)	1.4x10-04	1.5x10-04	2.4x10-03/1.2x10-05	2.1x10-03/2.5x10-05
Mercury and compounds (inorganic)	1.4x10-04	1.5x10-04	2.4e10-03/1.2x10-05	2.1x10-03/2.5x10-05
Nickel and compounds	0.61	4.6	1.4**/1.6x10-01**	7.5x10-02/8.3x10-03
Nitrate (as N)	10	--	--	--
Pentachlorobenzene	7.4x10-02	8.5x10-02	--	--

Table 2.2-2

Federal Water Quality Criteria for Protection of Human Health and Aquatic Life
Site 34, Pease AFB, NH
(Continued)

Parameter	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life[a]	
	Water and Fish Ingestion (mg/L)	Fish Consumption Only (mg/L)	Freshwater Acute/Chronic (mg/L)	Marine Acute/Chronic (mg/L)
Pentachlorophenol	2.8x10-04	8.2x10-03	2.0x10-02/1.3x10-02	1.3x10-02/7.9x10-03
Phenol	21	4,600	1.0x10+01/2.5	5.8
Polychlorinated biphenyls (PCBs)	7.9x10-08	7.9x10-08	2.0x10-03/1.4x10-05	1.0x10-02/3.0x10-05
Selenium and compounds	--	--	0.02/5.0x10-03	0.30/0.07
Silver and compounds	--	--	4.1x10-03**	2.3x10-03
1,1,2,2-Tetrachloroethane	1.7x10-04	1.1x10-02	--	--
Tetrachloroethanes	--	--	9.3*	--
Tetrachloroethene	8x10-04	8.9x10-03	--	--
Thallium and compounds	1.7x10-03	6.3x10-03	--	--
Toluene	6.8	200	--	--
1,1,1-Trichlorethane	--	--	--	3.1x10+01*
1,1,2-Trichlorethane	6x10-04	4.2x10-02	--	--
Trichlorethene	2.7x10-03	8.1x10-02	--	
2,4,5-Trichlorophenol	26	--	0.1[P]/6.3x10-02	0.24[P]/1.1x10-02[P]
2,4,6-Trichlorophenol	2.1x10-03	6.5x10-03	9.7x10-01*	--

Table 2.2-2

Federal Water Quality Criteria for Protection of Human Health and Aquatic Life
Site 34, Pease AFB, NH
(Continued)

Parameter	CWA Water Quality Criteria for Protection of Human Health		CWA Ambient Water Quality Criteria for Protection of Aquatic Life[a]	
	Water and Fish Ingestion (mg/L)	Fish Consumption Only (mg/L)	Freshwater Acute/Chronic (mg/L)	Marine Acute/Chronic (mg/L)
Vinyl chloride	2x10-03	5.3x10-01	--	--
Zinc and compounds	--	--	0.12/0.11	9.5x10-02/8.6x10-02

[a]Federal Water Quality Criteria (FWQC) are not legally enforceable standards, but are potentially relevant and appropriate to CERCLA actions. CERCLA 121(d)(2)(B)(i) requires consideration of four factors when determining whether FWQC are relevant and appropriate: (1) the designated or potential use of the surface water or groundwater; (2) the environmental media affected; (3) the purposes for which such criteria were developed; and (4) the latest information available.

*Lowest observed effect level.
**Hardness-dependent criteria (100 mg/L used); refer to specific criteria documents for equations to calculate criteria based on other water hardness values.

Source: CERCLA Compliance with Other Laws Manual. Interim Final. 8 August 1988.
P = Proposed value.

Table 2.2-3

Federal and State Ambient Air Quality Standards and State Toxic Air Pollutant Ambient Air Limits Site 34, Pease AFB, NH

Pollutant	National Ambient Air Quality Standards (40 CFR 50) ($\mu g/m^3$)/(ppm)	Ambient Air Standards (NH Admin. Code, Chapt. 300, Part 303) ($\mu g/m^3$)	Selected Toxic Ambient Air Limits (AALs) (NH Admin. Code Env-A-1300) ($\mu g/m^3$)
Carbon monoxide (CO)	40,000 (1-hour average)/35 (1-hour average) 10,000 (8-hour average)/9 (8-hour average)	40,000 (1-hour average) 10,000 (8-hour average)[a]	--
Lead (Pb)	1.5 (3 months)	1.5 (annual)	--
Nitrogen dioxide (NO_2)	100 (annual)/0.053 (annual)	100 (annual)	--
Ozone (O_3)	235 (1-hour)/0.12 (1-hour)	235 (1-hour)	--
Particulate matter (PM-10)	150 (24-hour)/NA	150 (24-hour)[b]	--
Sulfur dioxide (SO_2)	1,300 (3-hour)/0.5 (3-hour) 365 (24-hour)/0.14 (24-hour) 80 (annual)/0.036 (annual)	1,300 (3-hour) 365 (24-hour) 80 (annual)	--
Hydrocarbons (HC)		160 (3-hour)	--
Acetone			17,800
Arsenic			0.48
Barium			1.7
Benzene			71
Beryllium			0.0048
Chromium			0.12
Cobalt			0.167
Copper			0.33
Ethylbenzene			1,450
Gasoline			3,000
Manganese			16.7

Table 2.2-3

Federal and State Ambient Air Quality Standards and State Toxic Air Pollutant Ambient Air Limits Site 34, Pease AFB, NH (Continued)

Pollutant	National Ambient Air Quality Standards (40 CFR 50) ($\mu g/m^3$)/(ppm)	Ambient Air Standards (NH Admin. Code, Chapt. 300, Part 303) ($\mu g/m^3$)	Selected Toxic Ambient Air Limits (AALs) (NH Admin. Code Env-A-1300) ($\mu g/m^3$)
Methyl ethyl ketone (2-Butanone)			1,967
Nickel			0.12
Xylenes			1,450
Zinc			50

[a]This maximum 8-hour level may not be exceeded more than once per year.
[b]This maximum 24-hour level may not be exceeded more than once per year.
NA = Not applicable.

Table 2.2-4

State Groundwater Regulatory Criteria
Site 34, Pease AFB, NH

Parameter	New Hampshire Division of Public Health Services[1]		New Hampshire[2] Drinking Water Quality Standards		
	Advisory Level	Source	MCL	MCLG	SMCL
Inorganics					
Metals (mg/L)					
Aluminum	-	-	u	--	0.2
Arsenic	0.05	MCL	0.05	--	--
Barium	2	MCL	2	2	--
Boron	0.62	LHA	u	--	--
Cadmium	0.005	MCL	0.005	0.005	--
Chromium (total)	0.1	MCL	0.1	0.1	--
Iron	-	-	--	--	0.3
Lead	0.015*	MCL	0.015	0	--
Manganese	-	-	--	--	0.05
Mercury	0.002	MCL	0.002	0.002	--
Nickel	0.1	MCL	--	0.1	--
Potassium	35,000	BHRA	--	--	--
Sodium	-	-	--	--	100 to 250
Zinc	-	-	--	--	5
Organics:					
Pesticides/PCBs (ug/L)					
Pentachlorophenol	1	MCL	1	0	30
VOCs (µg/L)					
Benzene	5	MCL	5	0	--
Chlorobenzene (mono)	100	MCL	100	100	--
1,2-Dichlorobenzene	600	MCL	600	600	10
1,4-Dichlorobenzene	75	MCL	75	75	5
1,1-Dichloroethane	81	BHRA	URM	--	--

Table 2.2-4

State Groundwater Regulatory Criteria
Site 34, Pease AFB, NH
(Continued)

Parameter	New Hampshire Division of Public Health Services[1]		New Hampshire[1] Drinking Water Quality Standards		
	Advisory Level	Source	MCL	MCLG	SMCL
1,1-Dichloroethene	7	MCL	7	7	--
cis-1,2-Dichloroethene	70	MCL	70	70	--
trans-1,2-Dichloroethene	100	MCL	100	100	--
Ethylbenzene	700	MCL	700	700	30
Tetrachloroethene	5	MCL	5	0	--
Toluene	1,000	MCL	1,000	1,000	40
1,2,4-Trichlorobenzene	70	MCL	UDM	9[f]	--
1,1,1-Trichloroethane	200	MCL	200	200	--
Trichloroethene	5	MCL	5	0	--
Trichlorofluoromethane	2,000	LHA	--	--	--
Xylenes (total)	10,000	MCL	10,000	10,000	20
SVOCs (µg/L)					
bis(2-Ethylhexyl) phthalate	--	--	--	0	--
Naphthalene	20	LHA	UDM	--	--
Phenol	4,000	LHA	--	--	--

Source:
[1]New Hampshire Division of Public Health Services Advisory Levels dated 5 June 1992.

Notes:
BHRA = Bureau of Health Risk Assessment Drinking Water Criterion.
CAG = EPA Risk Value for 10^{-6} risk.
f = Concentration differs from Federal criteria.
FL = federally listed only.
LHA = Lifetime Health Advisory.
NIPDWR = National Interim Primary Drinking Water Regulations.
MCL = Maximum Contaminant Level (enforceable; as close to MCLG as technically feasible).
MCLG = Maximum Contaminant Level Goal (protective of human health; no known or expected adverse health effects).
SCML = Secondary Maximum Contaminant Level (protective of human welfare; primarily aesthetic).

Table 2.2-4

State Groundwater Regulatory Criteria
Site 34, Pease AFB, NH
(Continued)

tt = Treatment Technique.
URM = Unregulated organic contaminant requiring monitoring once, with a sample and a confirmation sample.
URM2 = Unregulated organic contaminant requiring monitoring for a minimum of 1 year (four consecutive quarters).
UDM = Unregulated organic contaminant requiring discretionary monitoring.
WQC = Water Quality Criteria.

These criteria assume that only one contaminant is present. Additive or synergistic effects of two or more compounds may require lower criteria.
*Environmental conditions can affect the aesthetic value of water only; actual regulated value left to the state.
u = Unregulated inorganic contaminants. Treatment, substitution, or closure of the source of these contaminants will be sought by the NHDES based on the recommendation of the NH Health Risk Assessment Unit, EPA SNARLS, or other health references.
-- = Criteria not available.

The aforementioned requirements would apply to new discharges to groundwater outside a Groundwater Management Zone (Env-Ws 410.26), but would not apply to discharges to the groundwater within the capture zone of a groundwater extraction and treatment system associated with remediation of contaminated groundwater under a groundwater monitoring permit. Further discussion of Env-Ws 410, including the state's policy for dealing with sites where groundwater has been contaminated by past discharges (Groundwater Management Zone Policy), is presented in Subsection 2.2.4.

Wastewater to POTW

NHCAR Env-Ws 900, Part 904, has established pretreatment standards and guidelines for wastes that are discharged to a publicly owned treatment works (POTW).

Air Emissions

NHCAR Env-A 300, Parts 303 and 304, have established primary and secondary ambient air quality standards (equivalent to federal standards). These requirements are listed in Table 2.2-3 and are summarized as follows:

(a) Particulate Matter

- The annual arithmetic mean for particulate matter shall not exceed 50 $\mu g/m^3$.
- The maximum 24-hour average concentration for particulate matter shall not exceed 150 $\mu g/m^3$.

(b) Sulfur Dioxide

- The annual arithmetic mean for sulfur dioxide shall not exceed 0.030 ppm or 80 $\mu g/m^3$.
- The maximum 24-hour concentration shall not exceed 0.14 ppm or 365 $\mu g/m^3$ more than once per year.
- For secondary standards, the maximum 3-hour concentration shall not exceed 0.5 ppm or 1,300 $\mu g/m^3$ more than once per year.

(c) Carbon Monoxide

- The maximum 8-hour concentration shall not exceed 9 ppm or 10 mg/m^3 more than once per year.

- The maximum 1-hour concentration shall not exceed 35 ppm or 40 mg/m^3 more than once per year.

(d) Nitrogen Dioxide

- For primary and secondary standards, the annual arithmetic mean for nitrogen dioxide shall not exceed 0.05 ppm or 100 $\mu g/m^3$.

(e) Ozone

- For primary and secondary standards, the maximum 1-hour average concentration of ozone shall not exceed 0.12 ppm or 235 $\mu g/m^3$.

(f) Hydrocarbons

- In order to achieve primary and secondary standards, the maximum 3 consecutive hour concentration, from 6:00 a.m. through 9:00 a.m., of nonmethane hydrocarbons shall not exceed 0.24 ppm or 160 $\mu g/m^3$ more than once per year.

(g) Lead

- In order to achieve primary and secondary standards, the maximum arithmetic mean averaged over a calendar quarter shall not exceed 1.5 $\mu g/m^3$.

NHCAR Env-A, Part 1303, identifies toxic air pollutants to be regulated. These pollutants are also listed by EPA in 40 CFR 61. Toxic ambient air limits (AALs) established for some of the chemicals detected at Site 34 are listed in Table 2.2-3.

NHCAR Env-A, Chapters 600, 1000, and 1200, have established standards for the release of air emissions, including VOCs and hazardous air pollutants. Applicable standards include the most stringent of the following requirements:

- New Source Performance Standards (40 CFR 60).

- National Emission Standards for Hazardous Air Pollutants (40 CFR 61).

- New Hampshire State Implementation Plan Limits.

  See RSA 125-C:6, NHCAR Env-A 101.09. and Env-A 606.01. Remedial action may be necessary to prevent unpermitted air emissions from the site. including volatilization of soil contaminants. during remedial activities.

2.2.3 Location-Specific ARARs

Location-specific requirements "set restrictions on activities depending on the characteristics of a site or its immediate environs" (52 FR 32496). In determining the use of these location-specific ARARS to select remedial actions for CERCLA sites. one must investigate the jurisdictional prerequisites of each of the regulations. Basic definitions. exemptions, etc.. should be analyzed on a site-specific basis to confirm the correct application of the requirements. A description of Site 34 and its immediate environs is contained in Section 1.

Fish and Wildlife Coordination Act

The purposes of the FWCA are to conserve and promote conservation of fish and wildlife and their habitats. The FWCA pertains to activities that modify a stream or river and affect fish or wildlife. Actions must be taken to protect those fish and wildlife resources affected by site activities.

__State of New Hampshire Requirements__

Wetlands Impact

RSA 485-A:17 and Env-Ws 415 establish criteria for conducting any activity in or near state surface waters that significantly alters terrain or may otherwise adversely affect water quality, impede natural runoff, or create unnatural runoff. Activities within the scope of these provisions include excavation, dredging, filling, mining, and grading of topsoil in or near wetlands areas. Remedial activities near or adjacent to wetlands or surface water must comply with these criteria for the protection of state surface waters.

RSA 482-A and (Env-Wt) 300 to 400, 600, and 700 regulate filling and other activities in or adjacent to wetlands, and establish criteria for the protection of wetlands from adverse effects on fish, wildlife, commerce, and public recreation. Remedial activities in wetlands located in or adjacent to the site must comply with these wetlands protection requirements.

Wellhead Protection Program

The New Hampshire Wellhead Protection Program, instituted under RSA 485:48 of the New Hampshire Administrative Code, has been approved by the Council on Resources and Development and EPA.

Under the program, wellhead protection areas (WHPAs) for public wells (private homeowner wells are not included in this program) will be delineated and potential groundwater contamination sources (PCSs) within those areas will be identified and managed. The state's program for managing PCSs will include educating industry personnel on management and handling practices that reduce the risk of groundwater contamination. These practices are called Best Management Practices (BMPs). Management inspections will be performed periodically at each identified operation in a WHPA to ensure that BMPs are being used. Rules for these BMPs and the authority to enforce them at the state and local levels are proposed under a draft groundwater classification system for the state. Additional regulatory and nonregulatory tools are available to local governments for the management of PCSs in WHPAs; guidance on these will be made available through the Office of State Planning.

2.2.4 Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish an alternative. Since there are usually several alternative actions for any remedial site, different requirements can come into play. These action-specific requirements do not in themselves determine the remedial alternative; rather, they affect how a selected alternative must be achieved.

The distinction between substantive requirements and administrative requirements at a CERCLA site is important when reviewing different action alternatives. Substantive requirements pertain directly to actions or conditions in the environment while administrative requirements pertain to permits that facilitate implementation of a requirement. At CERCLA sites, actions taken on-site are exempt from the administrative requirements. For example, discharge to an on-site stream would be exempt from permit requirements, but discharge to a POTW would not be exempt.

<u>Wetlands Protection</u>

Through Executive Order No. 11990, regulations regarding protection of wetlands were promulgated by EPA under 40 CFR 6.302. As wetlands areas exist at Site 34, the following action-specific regulatory requirements represent potential ARARs:

- Avoid adverse impacts associated with the destruction or loss of wetlands.
- Avoid new construction on wetlands unless no other practicable alternative exists.
- Prepare a wetlands assessment if wetlands will be affected.
- Minimize adverse impacts on wetlands if no practicable alternative to the action exists.

Hazardous Materials Transportation Act

Through the Hazardous Materials Transportation Act (49 USC 1801 to 1813), regulations regarding the transportation of hazardous materials were promulgated by the Department of Transportation (DOT) under 49 CFR 107 and 171 to 177. If transportation of DOT-defined hazardous materials off-site is a potential remedial action at Site 34, the following action-specific regulatory requirements represent potential ARARs:

- Hazardous materials table (49 CFR 172.101).
- Required manifest information (49 CFR 172.101, 172.203, and 173).
- Transportation mode requirements (49 CFR 172.101 and 174 to 177).

- Packaging, labeling, and marking requirements (49 CFR 172, 178, and 179).
- Transportation placarding requirements (49 CFR 172, Subpart F).

Occupational Safety and Health Act

The Occupational Safety and Health Act (OSHA) (29 USCA 651) resulted in creation of the Occupational Safety and Health Administration to protect worker safety and to administer regulatory control for worker safety.

Under OSHA, general industry standards have been promulgated under 29 CFR 1910. The action-specific requirements given under 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, may apply to remedial activities at Site 34.

Clean Water Act

CWA regulations establish effluent standards for point source discharges as follows:

- Direct discharge to a surface water is governed by the National Pollutant Discharge Elimination System (NPDES) permitting requirements (Section 402 of the CWA). Specific permitting requirements are contained under 40 CFR 125, while specific effluent guidelines and standards are given in 40 CFR 401. It should be noted that no categorical effluent guidelines or standards have been established for hazardous waste sites. It should be noted, however, that standards established in 40 CFR 403.6 for various industrial uses may be indirectly applicable to hazardous waste site operations if the types of technologies employed during remediation are similar to the processes used in the regulated industry.

- Indirect discharge to a POTW is governed by pretreatment regulations [Section 307(b) of the CWA]. National pretreatment standards are addressed under 40 CFR 403. The standards specifically prohibit discharge of the following items (40 CFR 403.5):

  - Ignitable or explosive wastewater.

  - Reactive or toxic fume-generating wastewater.

  - Used oil.

- Solvent waste.
- Pollutants that pass through the POTW without treatment, interfere with POTW operations, contaminate POTW sludge, or endanger the health or safety of POTW workers.
- Transported pollutants, except at points designated by the POTW.

NPDES discharge limitations are based on meeting the following criteria:

- Location-specific, federally approved state water quality standards (40 CFR 122.44 and 131.40).
- Action-specific best available technology (BAT) economically achievable requirements to control toxic and nonconventional pollutants and best conventional technology (BCT) requirements to control conventional pollutants [40 CFR 122.44(a)]. However, technology-based limitations may be determined on a case-by-case basis.

Compliance with established limitations is based on discharge monitoring of pollutant mass, effluent volume, and frequency of discharge (40 CFR 122.41). Approved sampling and test methods must be used for monitoring (40 CFR 136.1 to 136.4). Discharge of CERCLA wastewaters to a POTW would constitute an off-site activity and, thus, is subject to all permitting requirements and local pretreatment requirements. When considering discharge of CERCLA wastewaters to a POTW, the POTW's record of compliance with its NPDES permit and pretreatment program requirements must be assessed to determine whether the POTW is a suitable disposal site for CERCLA wastewater.

EPA's Groundwater Protection Strategy for the 1990s

In July 1989, EPA established a Groundwater Task Force to review EPA's groundwater protection programs and to develop concrete principles and objectives to ensure effective and consistent decisionmaking in all EPA activities affecting the resource. The outcome of this effort is a report entitled, *Protecting the Nation's Groundwater: EPA's Strategy for the 1990s.* Since this policy is intended to direct the course of EPA's efforts in the coming years, it has the potential to significantly affect any action taken to remedy contaminated groundwater at

Pease AFB. which in turn may impact groundwater and source area remediation at Site 34. Specific components of this policy that may significantly affect groundwater remediation at Pease AFB are summarized as follows:

EPA's Groundwater Protection Principles

- The overall goal of EPA's groundwater policy is to prevent adverse effects on human health and the environment and to protect the environmental integrity of the nation's groundwater resources.

- In determining appropriate prevention and protection strategies, EPA will also consider the use, value, and vulnerability of the resource, as well as social and economic values. Thus, in decisionmaking, EPA must take a realistic approach to restoration based on actual and reasonably expected uses of the resource as well as social and economic values.

- The primary responsibility for coordinating and implementing groundwater protection programs has always been and should continue to be vested with the states. An effective groundwater protection program should link federal, state, and local activities in a coherent and coordinated plan of action.

EPA's Policy on Use of Quality Standards in Groundwater Protection and Remediation Activities

- MCLs under the SDWA will be used as reference points for water resource protection efforts when the groundwater in question is a potential source of drinking water.

- When MCLs are not available, EPA Health Advisory numbers or other approved health-based levels are recommended as points of reference.

- Water quality standards under the CWA will be used as reference points when groundwater is closely connected hydrologically to surface water ecological systems.

- In certain cases, MCLGs under the SDWA, or background levels, may be used in order to comply with federal statutory requirements.

- In general, remediation will attempt to achieve a total lifetime cancer risk level in the range of 10^{-4} to 10^{-6} and exposures to noncarcinogens below appropriate reference doses. More stringent measures may be selected based on such factors as the cumulative effect of multiple contaminants, exposure from other pathways, and unusual population sensitivities. Less stringent measures than the reference point may be selected where authorized by law based on such factors as technological practicality, adverse environmental impacts of remediation measures, cost, and low likelihood of potential use.

Clean Air Act

The CAA (42 USC 7401 et seq.) mandates EPA to establish regulations to protect ambient air quality. As such, it may be applied as an ARAR to Site 34 for remedial actions that potentially result in air emissions.

Under the CAA, three areas were identified for regulation:

- Establishment of National Ambient Air Quality Standards (NAAQS).
- Establishment of maximum emission standards as expressed under the National Emission Standards for Hazardous Air Pollutants (NESHAP).
- Establishment of maximum emission standards as expressed under the New Source Performance Standards (NSPS).

NAAQS and NESHAP represent chemical-specific requirements (see Table 2.2-3). The NSPS contain action-specific requirements.

The CAA was amended in 1990; however, most of the final rules to support this amendment have not yet been issued. It is expected that the new rules will include expanded permit requirements and maximum available control technologies for hazardous waste facilities.

State of New Hampshire Regulations

<u>Hazardous Waste Regulations</u>

The hazardous waste rules for the State of New Hampshire are presented in the NHCAR, Subtitle Env-Wm. These rules establish a hazardous waste permit program and a mechanism for monitoring hazardous wastes subject to other regulatory programs, such as NPDES.

A waste is considered hazardous by NHDES if it is listed in Env-Wm 400 of the Hazardous Waste Rules or is listed in 40 CFR 261. A waste also may be considered hazardous if it exhibits any of the ignitability, corrosiveness, reactivity, or TCLP characteristics set forth in 40 CFR 261.

These provisions establish standards applicable to the identification, listing, and delisting of hazardous waste; permitting; inspection; enforcement; and recycling requirements. These rules also set requirements for owners and operators of hazardous waste facilities, and transporters and generators of hazardous waste.

These regulations may be applicable or relevant and appropriate for remedial activities at Site 34. Any activity involving handling or moving a waste or soil and debris determined to be hazardous may involve Env-Wm Hazardous Waste Rules.

Solid Waste Requirements

State of New Hampshire requirements for solid waste management are contained in the New Hampshire Solid Waste Rules, NHCAR Env-Wm 100 to 320 and 2100 to 2800. These provisions establish standards applicable to the treatment, storage, and disposal of solid waste and the closure of solid waste facilities. Nonhazardous solid waste on-site must be managed, stored, treated, and disposed of in accordance with the Solid Waste Management Act and the rules thereunder.

Underground Storage Tank Requirements

State of New Hampshire requirements for the installation, permitting, testing, operation, maintenance, and closure of USTs are contained in the NHCAR, Env-Ws 411, General Requirements for Tanks at Underground Storage Facilities. These regulations outline procedures and requirements for management of underground storage facilities, including the following:

- Facility Registration (Env-Ws 411.04).
- Permit to Operate (Env-Ws 411.07).
- Transfer of Facility Ownership (Env-Ws 411.08).
- Inventory Monitoring (Env-Ws 411.11).
- Tank Tightness Testing (Env-Ws 411.13).
- Spill/Overfill Protection (Env-Ws 411.25).
- Release Detection for Tanks Without Secondary Containment and Leak Monitoring (Env-Ws 411.29).
- Corrosion Protection for Steel Tanks (Env-Ws 411.32).
- Permanent Closure (Env-Ws 411.18).
- Secondary Containment for New Tanks (Env-Ws 411.23).

These regulations apply to tanks with capacities greater than 110 gallons that store regulated substances, including motor fuels, heating oils, lubricating oils, other petroleum products, and petroleum-contaminated liquids and hazardous substances. These regulations would apply to the JP-4 and oil/water underground tanks at Site 34. If remediation activities at the site involve testing, retrofitting, or removal of USTs, these activities will be executed in accordance with the aforementioned requirements.

The State of New Hampshire has also developed a guidance document entitled, *Interim Policy for the Management of Soils Contaminated from Spills/Releases of Virgin Petroleum Products* (NHDES Virgin Petroleum Products Policy). This policy identifies options for treatment, current analytical methods, and remediation goals for virgin petroleum-contaminated soils. Remediation of soils at Site 34 that have been contaminated by virgin petroleum products will be handled in accordance with this policy.

Remediation goals established for virgin petroleum-contaminated soil are as follows:

Gasoline

- Benzene, toluene, ethylbenzene, and xylene (BTEX) — 1.0 ppm.
- Total petroleum hydrocarbons (TPHs) — 10.0 ppm.

Diesel fuel or other fuel oils

- BTEX — 1.0 ppm.
- TPHs — 100.0 ppm.

According to NHDES, remediation goals for soil contaminated with JP-4 would be the same as those presented for diesel and other fuel oils. Currently, NHDES does not have a formal policy for the handling of soils contaminated by hazardous wastes or waste oils resulting from the operation of underground storage systems. These materials will be dealt with in a future NHDES policy document.

Groundwater

As previously indicated, the State of New Hampshire has adopted Goundwater Protection Rules (Env-Ws 410).

These rules present the state's policies and procedures for dealing with new discharges of contaminants to groundwater and to groundwater already contaminated by past discharges.

Air Emissions

The air emissions requirements of the State of New Hampshire are summarized as follows:

- Demonstrating Conformance (Env-A 101.26).
- Testing and Monitoring Procedures (Env-A 800.07 and 800.09).
- Malfunctions/Breakdowns of Air Pollution Control Equipment (Env-A 902).
- Fugitive Dust Emission Control (Env-A 1002).

- Incinerator Emission Standards (Env-A 1201).
- Controi of VOC Emissions (Env-A 1204).
- Impact Analysis and Permit Requirement (Env-A 1305).
- Toxic Air Pollutants (Env-A 1300).

Water Resources

Water resource requirements of the State of New Hampshire are as follows:

- Water Use Registration — Env-Wr 700, Part 701. Users of 20,000 gallons of water or more per day over 7 days or 600,000 gallons over 30 days must register with the Water Resources Division. Water flow measurements are defined in Part 702. Remedial activities involving the use of these quantities of water must comply with the requirements of this section.

Safety

Relevant safety requirements promulgated by the State of New Hampshire include the New Hampshire Department of Safety Rules for Transport of Hazardous Materials (Safety Ch. 600). These regulations govern the transport of hazardous materials and wastes. They must be complied with when removal action requires off-site transportation of hazardous waste.

Water Discharge Requirements

The water discharge requirements of the State of New Hampshire are summarized as follows:

- New Hampshire Industrial and Municipal Wastewater Discharge Permits (Env-Ws 403).
- Pretreatment Standards (Env-Ws 904).

APPENDIX C

DECLARATION OF CONCURRENCE

State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES
6 Hazen Drive, P.O. Box 95, Concord, NH 03302-0095
603-271-3503 FAX 603-271-2867
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NHDES

September 14, 1993

Mr. Alan P. Babbitt
Deputy for Hazardous Materials and Waste;
Deputy Assistant Secretary of the Air Force
(Environment, Safety and Occupational Health)
Suite 5C866, Pentagon
Washington, D.C. 20330-1660

RE: Site 34 Source Area Record of Decision
Pease Air Force Base Superfund Site
Pease Air Force Base, New Hampshire

Subject: Declaration of Concurrence

Dear Mr. Babbitt:

The New Hampshire Department of Environmental Services (NHDES) has reviewed the September 1993 Record of Decision (ROD) regarding Source Area Remedial Action at Site 34 - the Jet Engine Test Cell at the Pease Air Force Base Superfund Site located in Newington and Portsmouth, New Hampshire. The intent of the source control action is to reduce the potential leaching of soil contaminants to groundwater. Remedial actions necessary to address groundwater, surface water and sediment contamination will be addressed in the Zone 3 ROD.

A description of the source control actions, together with NHDES' position follows:

I. Excavation of contaminated soil from the JP-4 Tank Area, the Fuel Oil Tank/Waste Fuel Separator Area, the manhole area and holding tanks area, and transport to an approved off-site treatment/disposal facility. The final volume of soil to be removed will be determined at the time of remediation using field screening techniques. Removal of USTs and drain piping from the manhole to the Test Cell Ditch will also be incorporated into the source control action.

> As noted in the NHDES, "Interim Policy for the Management of Soils contaminated from Spills/Releases of Virgin Petroleum Products", soil excavation and treatment is one of many appropriate remedial methods which minimizes transfer of contaminants from one environmental medium to another. Treatment in a thermal desorption process system, treatment

and resource recovery at a NHDES permitted asphalt batch plant, as well as, disposal in a specifically authorized RCRA Subtitle D Landfill or RCRA facility are accepted methods for processing virgin petroleum contaminated soils. Field screening of the excavation will be conducted in accordance with Section VII - Sampling and Analysis Protocols of the NHDES Policy on Virgin Petroleum Contaminated Soils. Any wetlands adversely impacted by the source control action will be restored, subject to the provisions of RSA 482-A and Env-Wt 100 through Wt 800.

II. Dewatering of the site during soil excavation and treatment of the extracted groundwater at the existing on-site treatment facility, with subsequent discharge to the base sanitary sewer.

The discharge of treated groundwater from the Pilot Groundwater Treatment Plant to the base sewer will require the development of discharge limits in coordination with the City of Portsmouth (operator of the base wastewater treatment plant) in order to ensure compliance with the existing National Pollution Discharge Elimination System permit, pretreatment regulations and water pollution control laws.

III. Environmental monitoring:

Long-term monitoring will be necessary in order to determine the effectiveness of the source control action. Water quality monitoring is determined on a site specific basis and will be addressed in the Zone 3 ROD. Frequency and location of water quality monitoring is typically required on a tri-annual basis until a baseline condition is established. A comprehensive, detailed review will be conducted by the Air Force, the USEPA and the NHDES within five years after remediation to ensure the remedy provided adequate protection of human health and the environment.

Based upon its review, NHDES has determined the source area remedial action to be consistent with applicable or relevant and appropriate state requirements and policies. NHDES, as a party to the Pease Air Force Base Federal Facility Agreement, and acting as agent for the State of New Hampshire, concurs with the selected remedial action.

Sincerely,

Robert W. Varney
Commissioner

cc: Philip J. O'Brien, Ph.D., Director, NHDES-WMD
Carl W. Baxter, P.E., NHDES-WMEB
Richard H. Pease, P.E., NHDES-WMEB
Martha A. Moore, Esq., NHDOJ-PDA
Michael J. Daly, EPA
Arthur L. Ditto, P.E., AFBDA
James Snyder, AFCEE