Eielson Air Force Base
Operable Units 3, 4, and 5

Declaration of the Amended Record of Decision

Site Name and Location
Operable Units 3, 4, and 5
Eielson Air Force Base, Alaska

Statement and Basis of Purpose
This decision document presents the amended remedial action for Operable Units 3, 4, and 5 (OUs 3, 4, and 5) at Eielson Air Force Base (AFB), Alaska, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the May 1991 Federal Facilities Agreement entered into by the Air Force, the U.S. Environmental Protection Agency (EPA), and the State of Alaska, and to the extent practicable, the National Contingency Plan. This decision is based on the Administrative Record for OU 3, 4, and 5, updated in July 1998, to include new information generated since the original Record of Decision was signed on 30 September 1995. This amendment applies to OU3 site DP44 (Battery Shop Leach Field Building), OU4 sites SS35 (Asphalt Mixing Area) and ST58 (Old Quartermaster Service Station), and OU5 sites LF03/FT09 (Current Inactive Base Landfill / Fire Training Area).

The State of Alaska concurs with the selected remedy.

Assessment of the Sites
Based on new information made available after signing of the Record of Decision (ROD) document, EPA, ADEC and Eielson Air Force Base have selected alternate actions for sites DP44, SS35, ST58, and LF03/FT09 that are more appropriate for existing site conditions than those referenced in the original ROD document. Through new information, contaminant levels at these sites were determined to be at lower levels than interpreted prior to signing the original ROD document. Proper enforcement of Institutional Controls (IC's) at all sites will be effective in controlling and restricting access to contaminated media at the sites until remediation goals are achieved. Implementation of the amended selected alternative actions in the ROD amendment are shown, through evaluation against the nine criteria presented in the National Contingency Plan (NCP), to be as protective of human health and the environment as the remediation alternatives originally selected for these sites.

Description of the Amended Selected Remedy
Site DP44: DP44 is believed to be the location of past jet engine maintenance activities near an aircraft maintenance facility. Contaminants of concern are petroleum compounds and solvents in soil and groundwater. Additional investigation and pilot testing at the site indicate that contamination levels have decreased significantly through natural attenuation and biodegradation in both the soils and groundwater; therefore, the original remedy of soil vapor extraction is proposed to be changed as follows:

- Residual soil contamination is not expected to act as a continuing source of groundwater

contamination. No further action of soils is proposed.

- Continued monitoring to confirm that the groundwater contamination is not migrating and that contaminant levels are continuing to decrease.

- Implementation of institutional controls to prevent use of the contaminated groundwater in this area.

Site SS35: SS35 was used as an asphalt cement mixing area from the early 1950's to the late 1960's. Approximately 200 empty asphalt cement drums were reportedly disposed along the banks of Garrison Slough in this area. The original selected remedy included installation of a soil cover over the area to prevent direct contact and surface water runoff into Garrison Slough. Based on re-evaluation of site conditions from new information gathered after the ROD was signed, additional soil cover is not necessary for protection of human health or the environment at SS35. The amended selected remedy is:

- No action under the Superfund program; and

- Continued monitoring of surface water, sediments, and aquatic organisms at the site to confirm that concentrations remain at levels that are protective of human health and the environment.

Site ST58: ST58 was the site of a service station that was decommissioned in 1988. Contaminants of concern are lead and petroleum compounds in the soil and groundwater. For the lead contamination at ST58, subsequent evaluations and modeling have determined that groundwater restoration for this confined area is technically impracticable. For the petroleum contamination a 1993 removal of BTEX-contaminated soils from the most contaminated area of the site removed a majority of the petroleum contaminated soils. The level of remaining residual soil contamination does not warrant installation of a bioventing soil treatment system. Additional investigations have indicated that petroleum contamination is being addressed through natural attenuation and biodegradation in both the soils and groundwater; and therefore, the original remedy of bioventing is proposed to be changed as follows:

- Residual soil contamination does not appear to be adversely impacting the groundwater; therefore, no further action of soils is proposed.

- Continued monitoring to confirm that the groundwater lead or petroleum contamination are not migrating and are remaining within the currently established containment area.

- The action level would be waived for lead contamination in groundwater within this limited containment area due to technical impracticability from an engineering perspective.

- Implementation of institutional controls to prevent exposure to contaminated groundwater in this area to ensure protection of human health and the environment.

Sites LF03/FT09: LF03 occupies approximately 100 acres and was used as the main base landfill from 1967 to 1987. FT09, which is located on top of the landfill, was used for fire-training

exercises from 1955 to 1989. No fundamental changes are proposed to the selected remedy; however, clarification of regulatory issues is warranted. The Air Force had previously indicated that there was documented evidence of disposal of hazardous waste in the post-1980 disposal area. A subsequent search of Air Force and Fairbanks North Star Borough records after the signing of the original ROD could not confirm this disposal of hazardous waste. Given the lack of documentation of hazardous waste disposal RCRA subtitle C is relevant and appropriate as an ARAR but is not applicable. Groundwater concentrations adjacent to the landfill are below State and federal regulatory levels, therefore an impermeable cover to prevent movement of groundwater through the landfill is not warranted. The amended selected remedy is clarified as follows:

- A cover to address the direct contact threat will be maintained in accordance with relevant and appropriate requirements of the Resource Conservation and Recovery Act Part 264.

- Groundwater at and adjacent to the landfill will continue to be monitored to verify that contaminant concentrations remain below acceptable regulatory levels.

- Institutional controls will be implemented to restrict land use to prevent direct exposure to landfill waste.

The major components of the **amended** selected remedies for sites DP44, SS35,ST58, and LF03/FT09 include

- Monitor Surface Water, Sediments, and aquatic organisms at Site SS35 to confirm that contaminant concentrations remain at levels that are protective of human health and the environment.

- Monitor groundwater at sites DP44, ST58, and LF03/FT09 to evaluate contaminant levels and migration until remediation levels are achieved.

- Application of the Technical Impracticability Waiver to lead groundwater contamination at site ST58.

- Implement and enforce institutional controls to prevent exposure to contaminated media at DP44, ST58, and LF03/FT09.

- In the event of base closure, any remaining contaminated sites will be addressed in accordance with CERCLA Section 120.

Statutory Determination

The amended selected remedies are protective of human health and the environment and are cost effective. The amended selected remedies comply with Federal and State requirements that are

legally applicable or relevant and appropriate to the remedial action with the exception of the action level for lead established under the Safe Drinking Water Act (40 CFR 141.80). A waiver of the lead action level is justified because compliance with the requirement is technically impracticable from an engineering perspective. The remedies utilize permanent solutions to the maximum extent practicable. However, because treatment of the principal threats of the sites were found to be practicable, these remedies do not satisfy the statutory preference for treatment as a principal element.

Because these remedies will result in hazardous substances remaining onsite above health-based levels, reviews will be conducted at sites DP44, ST58, and LF03/FT09 each 5 years during the five-year ROD review process to ensure that the remedies continue to provide adequate protection of human health and the environment.

Signature and Support Agency Acceptance of the Amended Remedy for Operable Units 3, 4, and 5, and Other Areas, Eielson Air Force Base

JENNIFER ROBERTS, Section Manger
Contaminated Sites Remediation Program
Alaska Department of Environmental Conservation

March 19, 2001
Date

Signature and Support Agency Acceptance of the Amended Remedy for Operable Units 3, 4, and 5, and Other Areas, Eielson Air Force Base

CHARLES R. HEFLEBOWER, Lt Gen, USAF
Vice Commander

27 May 99
Date

Signature and Support Agency Acceptance of the Amended Remedy for Operable Units 3, 4, and 5, Eielson Air Force Base

Chuck Clarke

CHUCK CLARKE
Regional Administrator
Region 10
U.S. Environmental Protection Agency

9/29/98
Date

AMENDMENT OUTLINE
OPERABLE UNITS 3,4,5 RECORD OF DECISION
EIELSON AIR FORCE BASE
SOURCE AREAS DP44, SS35, ST58, & LF03/FT09

1.0 Introduction

1.1 Site Name and Location: Operable Unit 3,4,5, Source Areas DP44, SS35, ST58, LF03/FT09, Eielson Air Force Base, Alaska.

1.2 Identification of Lead and Support Agencies

Lead agency: Department of Defense, Eielson AFB, Alaska
Program Manager: Michael Raabe
354 CES/CEVR
2258 Central Ave Ste 100
Eielson AFB, AK 99702-2299
(907) 377-1164

Support Agencies: U.S. Environmental Protection Agency, Region 10
Project Manager: Mary Jane Nearman
Office of Environmental Cleanup Unit #4
1200 - 6th Avenue, HW-124
Seattle, WA 98101
(206) 553-6642

Alaska Department of Environmental Conservation
Project Manager: Ronan Short
610 University Avenue
Fairbanks, AK 99709-3643
(907) 451-2156, (907) 451-2183

1.3 Citation of CERCLA Section 117 and NCP Section 300.435(c)(2)(ii) and Date of ROD signature

The OU 3,4,5 ROD amendment has been prepared in accordance with the procedures specified in CERCLA section 117 and the National Contingency Plan section 300.435 (c)(2)(ii). The original ROD was signed on 30 September 1995.

1.4 Summary of the Circumstances That Lead to the Need for a ROD Amendment

Based on recent sampling results at site ST58, a pilot scale soil vapor extraction system at site DP44, clarification of RCRA Subtitle C with respect to LF03/FT09, and a re-evaluation of the Baseline Risk Assessment for OU 3,4,5 and Sitewide Biological Risk Assessment with respect to site SS35, the selected remedies are being amended from those presented in the original ROD for OUs 3, 4, and 5. The new information indicates that another alternative from those selected in the ROD provides the best balance of the tradeoffs among the alternatives with respect to the nine evaluation criteria.

1.5 Statement That the ROD Amendment Will Become Part of the Administrative Record File

The OU 3,4,5 ROD amendment shall be added to the administrative record file in accordance with the NCP section 300.825(a)(2).

1.6 Address of Location and Hours of Availability of Administrative Record File

The OU 3,4,5 ROD with the Responsiveness Summary and this ROD amendment will be available in the Administrative Record at the information repositories listed below. Information used to support the selection of the amended remedy has been included in the Administrative Record, which is available for public review at:

Elmer E. Rasmuson Library (Archives Section)
Alaska and Polar Regions Department
University of Alaska Fairbanks
Fairbanks, Alaska 99775
(907) 474-6594

2.0 Summary of Site History, Contamination Problems, and Selected Remedy

2.1 DP44 Site History

Source area DP44 is located near the Large Aircraft Maintenance Hangar (Bldg. 1140). As originally defined, DP44 included the wastewater disposal leach field from the battery shop (Building 1141) and the area around Building 1138 between the runway taxiway and Flightline Avenue west of the North street intersection (see Figure 2.1 in OU3,4,5 ROD). DP44 was identified as a source area because, in the past, the battery shop and Building 1138 may have discharged waste into a leach field system within the area. However, subsequent investigations have not confirmed the existence of this leach field. Most of the contamination in this source area is located south of the hangar, and is probably related to past jet-engine maintenance activities in the hangar. Identified contaminants of concern are fuel-related compounds and solvents in the groundwater and soil.

2.1.1 Contamination Problems

Soil contaminants greater than EPA risk-based screening levels or background concentrations for DP44 are summarized in Table 2.1. Soil contaminants listed in Table 2.1 are poly aromatic hydrocarbons (PAHs) that were found at maximum concentrations in a surface soil sample collected during the drilling of Well 44M03. This sample was collected in a gravel parking lot

that contained fragments of asphalt. Because the parking lot is in close proximity to the runway, it was routinely maintained by spraying oil for dust suppression. The source of the PAHs could be from exhaust from vehicles parked in the lot, exhaust from aircraft on the nearby runway, or asphalt residue. These contaminants are highly sorptive and immobile.

The concentrations of solvent and benzene did not exceed screening levels for direct exposure. However, subsurface concentrations of solvent and benzene were estimated to be sufficiently high to leach into the groundwater to yield concentrations that exceed groundwater screening levels. Therefore, even though solvent and benzene contamination in soils does not exceed screening levels based on direct exposure to the soil, it may be the source of groundwater contamination through the leaching pathway.

In August 1994, 13 soil borings were drilled in the vicinity of Well 44M04 to determine the extent and concentration of chlorinated solvents in soils south of the large aircraft maintenance hangar. Locations for the borings were determined using a soil-gas survey. The soil-gas survey indicated that contaminated soils extended to the west under the aircraft parking ramp. The borings were completed through the vadose zone to the water table, located at approximately 3 m (10 ft) below land surface in this vicinity. Samples were taken at three depth intervals, 0.6 to 1.2 m (2 to 4 ft), 1.2 to 1.8 m (4 to 6 ft), and 2.4 to 3 m (8 to 10 ft) below land surface. The samples were analyzed for chlorinated solvents and BTEX compounds. TCE and total DCE results are illustrated in Figures 6.1 through 6.3 in the OU3,4,5 ROD. Low levels (less than screening levels) of toluene were detected in some of the soil samples.

Table 2.1 Surface and Subsurface Soil Contaminants Greater Than Screening Levels, DP44

Chemical	Detection Limit (µg/kg)	# Analyzed/ # Detected	Concentration Range (µg/kg)	Location of Maximum Detect
Anthracene	20	4/1	5500-5500	44M03
Benzo(a) anthracene	10	4/3	200-48,000	44M03
Benzo(a)pyrene	9	3/2	470-18,000	44M03
Benzo(b)fluoranthene	30	4/3	460-210,000	44M03
Benzo(g, h, i)perylene	40	4/3	280-14,000	44M03
Chrysene	70	4/2	280-21,000	44M03
Dibenzo(a, h)anthracene	50	4/1	6500-6500	44M03
Indeno(1, 2, 3-cd)pyrene	50	4/3	270-15,000	44M03

Groundwater contaminants in samples collected from monitoring wells that are greater than EPA risk-based screening levels or background concentrations for DP44 are summarized in Table 2.2. During field investigations at DP44 prior to 1994, benzene and TCE were found in the groundwater above their 5 µg/L maximum contaminant levels (MCLs). Toluene, ethylbenzene, and xylene were also detected, but at concentrations below their MCLs. Benzene contamination above 5 µg/L covered an area of approximately 3300 m^2 (3947 yd^2), with Well 44M02 displaying the highest benzene concentration. Groundwater probe data collected in 1988 indicated that benzene concentrations up to 4000 µg/L existed near the top of the water table. Benzene concentrations detected in 1990 had diminished fourfold since the 1988 sampling. By 1992 and

1994, benzene levels decreased to just above the MCL. For details on 1992 and 1994 benzene concentrations at DP44, refer to Figures 6.4 and 6.5 in the OU3,4,5 ROD. The 1992 data were used in the risk assessment and are reported in Table 2.2 and Appendix A of the OU 3, 4, 5 ROD. Two areas of TCE contamination were detected in the groundwater above the 5 µg/L MCL, including Well 44M03 and Well 44M04, with TCE concentrations above 100 µg/L in Well 44M04. The two sites of TCE contamination appeared to be unrelated and relatively limited, based on groundwater probe results, which showed no detectable TCE between the sites or at adjacent probes or wells. The distribution of contamination near Well 44M04 indicated the source of TCE may be upgradient of DP44.

In August 1994, TCE and total DCE were still present in the vicinity of Well 44M04 in concentrations similar to previous years. These concentrations, as shown in Figures 6.6 and 6.7 in the OU3,4,5 ROD, were 109 ppb and 121 ppb, respectively. Results from the groundwater probe samples taken during the soil borings are also shown in Figures 6.6 and 6.7 in the OU3,4,5 ROD. They also show that chlorine solvent contamination extends away from Well 44M04 to the west under the aircraft parking ramp and to the north toward the hangar. The distributions for TCE and DCE are slightly different. Vinyl chloride has never been detected in any of the groundwater samples from DP44. No groundwater samples are available from underneath the hangar. Wells 44M03, 44M07, and 44M08, to the north of the hangar, show low levels of TCE and DCE contamination. The concentrations in all three wells are below MCLs. It is not known whether this contamination results from a second low-level source or is the leading edge of a plume located underneath the hangar. The total area of TCE-contaminated soils is approximately 6500 m^2 (69,000 ft^2) with a volume of 20,000 m^3 (25,500 cu yd) containing an estimated 3.2 kg of TCE.

All contaminants detected at DP44 were in aqueous form. No free-phase solvent or fuel was encountered. This data in addition to a more detailed accounting of the sampling history and analytical results can be found in the OU 3, 4, 5 ROD and the OU 3,4,5 Remedial Investigation (RI).

Table 2.2 Groundwater Contaminants Greater Than Screening Levels, DP44

Chemical	Detection Limit (µg/L)	# Analyzed/ # Detected	Concentration Range (µg/L)	Location of Maximum
Benzene	2	15/2	3.7-5.3	44M05
Trichloroethene	1	15/3	1.2-2500	44M04

2.1.2 The Selected Remedy for DP44 as Originally Described in the OU 3, 4, 5 ROD

The original selected remedy for DP44 was soil vapor extraction/groundwater monitoring/institutional controls. This alternative was originally chosen because of its effectiveness for treating chlorinated solvents that are found at this source area and because it was believed that SVE would reduce risk to human health and the environment sooner than monitoring and institutional controls alone. Groundwater extraction and treatment/SVE was not the preferred alternative because of its difficult implementation, and because biodegradation,

dispersion, dilution, and adsorption appear to be effectively containing and degrading the contamination.

The primary components of the original selected remedy were:

- Installation of a soil vapor extraction system to remove solvent contamination in soil posing a threat to groundwater through leaching.

- Implementation of institutional controls, as described, to prevent exposure to contaminated groundwater.

- Monitoring of the groundwater to evaluate contaminant levels and identify changes to contaminant plume configuration until remediation levels are achieved.

The original ROD also Stated that it could become apparent, during the design phase, implementation, or operation of the SVE system that solvent and fuel-related compounds in the soil and groundwater had declined or had fallen below levels that would pose an unacceptable risk. In such cases, the system performance standards or the remedy would be re-evaluated to allow for the contaminants to naturally degrade.

2.1.3 Amended Selected Remedy

In summer 1995, the Air Force conducted a pilot scale vapor extraction test to evaluate the rate of contaminant removal. The test results showed very low removal rates indicating that the contaminant concentration in soil is low. Contaminant concentrations in extracted vapors also confirmed that the mass of solvents in the subsurface soil is small.

Since the source of contamination is small, little additional contamination is expected to enter the groundwater from the soils; therefore, contaminant concentrations are expected to decrease through natural processes. The area of contamination is limited to an area of approximately 600 feet and does not appear to be expanding.

The additional investigation and pilot testing described above indicate that contamination is being addressed through natural attenuation and biodegradation in both the soils and groundwater; therefore, the original remedy of soil vapor extraction is proposed to be changed as follows:

- Residual soil contamination is not expected to act as a continuing source of groundwater contamination. No further action of soils under CERCLA is proposed.

- Continued monitoring and evaluation to confirm that the groundwater contamination is not migrating; and that contamination levels are continuing to decrease.

- Implementation of institutional controls to prevent exposure to contaminated soil and groundwater in this area.

2.2 SS35 Site History

Site SS35 is located in the central part of the base adjacent to Central Avenue, about 0.2 mile south of the Water Treatment Plant. Historical information is incomplete regarding use of this site. However, SS35 was used as a mixing area from the early 1950s to the late 1960s. Asphalt-cement was mixed in a tank and then used for road maintenance. Waste oils and solvents were mixed with contaminated fuels and used for road oiling to control dust. About 200 empty asphalt-cement drums were reportedly disposed of along the banks of Garrison Slough. The area may also have been used for mixing pesticides and cleaning pesticide spraying equipment. Contaminants of concern identified are pesticides, particularly DDT, in soil.

2.2.1 Contamination Problems

Geophysical studies were conducted at SS35 to identify potential locations of buried drums and other materials. During the 1988 geophysical investigation, two anomalies (anomaly areas A and B) indicating possible buried drums were identified (HLA 1989). The first anomaly (A) was a 23- by 69-m (25.2- by 75.5-yd) area identified in a location adjacent to Garrison Slough, roughly corresponding to an excavation area identified on historical aerial photographs. The area did not appear to have large numbers of buried drums , but does contain smaller areas concentrated with drums. The second anomaly (B), oriented northwest to southeast near Garrison Slough, may be an abandoned utility, such as a drainage culvert. Two small areas containing asphalt cement were present on the ground surface in this area, and aromatic and chlorinated hydrocarbons were detected near the center of the linear anomaly (B) in a soil gas survey.

A geophysical survey in 1990 identified a third anomaly (C) in the northern part of the source area extending about 38.1 m (41.7 yd) along the pond shoreline. Partially buried concrete rubble and demolition debris were visible in the brush and trees at the shoreline. It was concluded the area contained buried metal, concrete, and other demolition debris.

The contents of any drums buried at SS35 are generally unknown. In 1989, a number of drums were uncovered during the connection of Building 3460 to the utilidor. The burial site of the drums was located approximately 60 m (66 yd) east of anomaly area C, near the junction of the utilidor from Building 3460 with the Central Avenue utilidor. The contents of one drum uncovered at this time were analyzed for VOCs and semivolatile compounds (SVOCs) and metals. Its analysis is reported in HLA (1990).

DDT and its derivatives were found at low levels in almost all surface and subsurface soil samples collected in the 1988 and 1990 investigations. The highest concentration observed was 396 mg/kg in a surface soil sample collected at 35SS03, located within anomaly area A near Garrison Slough. Surface and subsurface soil contaminants greater than screening levels at SS35 are presented in Table 2.3 below. In addition, on sediment sample from the slough (35S01) was tested for pesticides in 1988. It was located near the inlet of the pond Garrison Slough forms adjacent to the source area and showed 0.4 mg/kg of DDD. DDT concentrations were lower, at 0.097 mg/kg. In 1990, a sediment sample (62S04) was collected from the slough adjacent to SS35 just upstream of the pond. In that sample, DDT and DDD were 62.4 and 58.6 mg/kg, respectively.

Table 2.3 Surface and Subsurface Soil Contaminants Greater Than Screening Levels, SS35

Chemical	Detection Limit (µg/kg)	# Analyzed/ # Detected	Concentration Range (µg/kg)	Location of Maximum Detect
4,4'-DDD	1	23/18	0.4-58,500	35SS03
4,4'-DDE	N/A	23/21	0.09-19,000	35DIR05
4,4'-DDT	20	23/22	4-396,000	35SS03
Aldrin	1	4/1	6.2-6.2	35M01
Alpha-BHC	10	8/1	17-17	35DIR05
Chlordane	2	23/8	3-410	35DIR06
Heptachlor Epoxide	N/A	8/1	13-13	35DIR05

Groundwater contaminants greater than EPA risk-based screening levels or background concentrations for SS35 are summarized in Table 2.4. In 1992, the measured concentrations of PCBs and DDT and its derivative products 4,4'-DDD and 4,4'-DDE were at or below their reported limits of detection.

Table 2.4 Groundwater Contaminants Greater Than Screening Levels, SS35

Chemical	Detection Limit (µg/L)	# Analyzed/ # Detected	Concentration Range (µg/L)	Location of Maximum
1,2-Dichloroethane	0.5	12/1	3.2-3.2	35GP03
4,4'-DDT	0.1	13/2	0.14-0.16	35GP02
Benzene	2	12/1	3.5-3.5	35GP03
Beta-BHC	0.05	13/1	0.05-0.05	35GP01

This data in addition to a more detailed accounting of the sampling history and analytical results can be found in the OU 3, 4, and 5 Record of Decision (ROD) and the OU 3,4,5 RI

2.2.2 The Selected Remedy for SS35 as Originally Described in the OU 3, 4, 5 ROD

The selected remedy as presented in the OU 3, 4, 5 ROD was a combination of Alternative 3 (Soil Cover) and Alternative 4 (Possible Removal of Drums), and was determined at the time the ROD was signed to be the most appropriate remedy for source area SS35. The placement of a clean

soil cover was intended to prevent contact with pesticide-contaminated soil and to prevent runoff of contaminated soil into Garrison Slough. The buried drums were to be left in place and the groundwater, surface water, sediments, and aquatic organisms monitored, as appropriate. Excavation of the contaminated soil and drums was not considered to be cost-effective.

The cover alternative focused on minimizing DDT migration into Garrison Slough and eliminating the surface soil exposure pathway. The cover was selected for those areas where DDT was detected above the residential risk-based levels in the surface soil. The soil cover was selected primarily for the purpose of limiting the migration of contaminants into Garrison Slough and to prevent direct soil contact and ingestion by the base personnel and ecological receptors.

The primary components of the original selected remedy were:

- Installation of a soil cover over the surface soil contamination to prevent direct contact by humans, animals, and surface water runoff into Garrison Slough;

- Removal of drums in the future, if it was determined that they are a continuing source of contamination;

- Monitoring of surface water, sediments, and aquatic organisms in this area, as required to verify effectiveness of the cover and monitoring of the groundwater to verify that levels remain below acceptable screening levels.

2.2.3 Amended Selected Remedy

Further evaluation of the sampling data indicated that the contaminant concentrations averaged over this relative area do not pose an unacceptable risk to human health or the environment. The maximum concentration found for pesticides did indicate a potential human health risk if this area were developed for residential use in the future. However, these maximum concentrations were isolated and were not consistent over the area. In addition, the potential for residential development in this area is very low. Therefore, additional soil cover is not necessary for protectiveness; the current soil cover is protective of both human and ecological receptors (OU3,4,and 5 Conceptual Design, 1996, page 15). The Final Sitewide Biological Risk Assessment was completed in May 1995 after the original ROD was signed. Based on new information in this report, the ecological risk for this source area indicated a environmental hazard quotient (EHQ) <1 for all summed pathways. The clean soil cover alternative was originally selected in part because it would mitigate ecological risk. Because the Sitewide risk work indicated that current ecological risk is not unacceptably high, the cover is not needed to mitigate ecological risk.

The concern with respect to surface water runoff into the slough was also re-evaluated. The area is covered with grass and is relatively flat with little expected soil erosion. In addition, the concentrations in the soils do not differ significantly from those found in the slough sediment; therefore, any surface water runoff that does occur is not expected to contaminate the sediments

or surface water. Surface water and sediments in Garrison Slough in this area do not pose a risk to human health or the environment.

Based on this re-evaluation, additional soil cover is not necessary for protection of human health or the environment at SS35. The amended selected remedy is:

- No action under the CERCLA program; and

- Continued monitoring of surface water, sediments, and aquatic organisms at the site to confirm that concentrations remain at levels that are protective of human health and the environment.

2.3 ST58 Site History

ST58, site of the old Quartermaster service station, is located on the northwest corner at the intersection of Division Street and Wabash Avenue. The service station covered approximately 400 m^2 (478 yd^2).

The Quartermaster service station was operated from 1970 to 1988. The service station was a source of petroleum products for private vehicles operated by Eielson AFB personnel and their dependents until 1975, and for Eielson AFB vehicles only after 1975. The service station used four $95m^3$ (25,000 gal) above-ground storage tanks, containing leaded and unleaded motor gasoline (MOGAS) and diesel. Two barrels of motor oil were stored at the service station for customer use.

Eielson AFB staff removed the above-ground storage tanks and above-ground piping in August 1988. Underground piping was left in place. During removal, workers noted evidence of product releases. No analytical work was performed. The surface was covered with a meter (a yard) of fill after the above-ground storage tanks and piping were removed (Liikala and Evans 1995). No spills have been reported at ST58. However, the pipeline that supplied fuel to ST58 was suspected of leaking at the intersection of Industrial Drive and Division Street, east of ST58. In 1993, approximately 532 cubic meters (700 cubic yards) of fuel-contaminated soil was removed from the area most highly contaminated for a composting demonstration project and replaced with clean fill material.

MOGAS and diesel stored and used at the Quartermaster service station appears to have been spilled or leaked from the piping and diesel tanks. Some of the volatile components of petroleum products released at the surface may have evaporated. The less volatile components probably seeped into the soil. The less volatile contaminants may have adsorbed to the soils or been dissolved in surface infiltration and carried to the groundwater. Fuel from large spills, if any occurred, may have moved through the vadose zone and formed a floating layer on the water table. Because the primary potential source of contamination (fuel storage tanks) has been removed, and the majority of contaminated soils were removed in 1993, residual contamination in the soil is limited.

Potential contaminants of concern are fuel-related organic compounds (BTEX) and lead. A variety of laboratory analyses for geotechnical and chemical parameters have been performed using different methods. Investigation of the site were carried out in 1991 (Shannon & Wilson 1991), in 1992 (Shannon & Wilson 1992), in 1993 (U.S. Air Force 1994b), and in 1994 (U.S. Air Force, 1995 a, b, c).

2.3.1 Contamination Problems

Groundwater contaminants greater than EPA risk-based screening levels or background concentrations for ST58 are summarized in Table 2.6. Investigations conducted during the fall of 1991 and winter of 1992 indicated that benzene concentrations in the groundwater downgradient of source area ST58 were greater than the drinking water standard. Toluene, ethylbenzene, and xylene were also detected.

In April 1993, groundwater samples were collected from the same wells. Benzene concentrations above drinking water standards were again found in several locations. Toluene and total xylenes were also detected. Gasoline-range petroleum hydrocarbons at a concentration of 200 µg/L were detected in one well. Diesel-range petroleum hydrocarbons, ranging in concentrations from 0.1 to 99 µg/L, were detected in 9 of 12 wells. Samples were analyzed for lead and it was found in concentrations above the EPA action level (15 µg/L) in all of the source area wells.

A follow-on investigation was conducted in the fall of 1994. Lead and benzene concentrations in the groundwater remain above the drinking water standard. The extent of benzene and lead contamination is shown in Figures 7.15 and 7.16 of the OU3,4,5 ROD.

All contaminants detected at ST58 were in aqueous form. No floating product was encountered, but it is likely that past fuel releases resulted in transient product plumes that have since dissipated after the service station was closed and the buried supply pipeline removed from service.

Table 2.5 Groundwater Contaminants Greater Than Screening Levels, ST58

Chemical	Detection Limit (µg/L)	# Analyzed/ # Detected	Concentration Range (µg/L)	Location of Maximum
Benzene	5	13/6	3.7-180	58MW08
Gasoline	2000	14/1	261,000-261,000	58MW09
Lead	5	14/13	35-180	58MW12

This data in addition to a more detailed accounting of the sampling history and analytical results can be found in the OU 3, 4, 5 ROD and the OU 3,4, 5 RI.

2.3.2 The Selected Remedy for ST58 as Originally Described in the OU 3, 4, 5 ROD

At site ST58 Alternative 3, an in situ alternative consisting of bioventing/groundwater monitoring/institutional controls, was determined to be the most appropriate remedy at the time the OU 3, 4, 5 ROD was signed. This alternative was selected to reduce the fuel source in the soils through degradation of fuel hydrocarbons, and thus reduce the risk to human health and the environment sooner than with monitoring and institutional controls alone. At the time the OU 3, 4, 5 ROD was signed, no proven method was known for removing lead from groundwater at a reasonable cost in a reasonable amount of time. However, a treatability test was being performed at another site ST13/DP26 at Eielson AFB to determine the fate and transport of lead and the most viable option for extraction and treatment. Results from the treatability study were to be used to further evaluate lead remediation at ST58. Groundwater extraction/bioventing (Alternative 4) was not the preferred alternative because of its difficult implementation, and because biodegradation, dispersion, dilution, and adsorption appear to be effectively containing and degrading the contamination.

Alternative 3 was selected to reduce the long-term source of contamination by preferentially encouraging the removal of contaminants from the soil through bioventing. Groundwater action will consisted of natural attenuation, institutional controls, and monitoring.

The primary components of the original selected remedy were:

- Installation of a bioventing system to remove fuels contamination in the soil that poses a threat to groundwater through leaching.

- Institutional controls to prevent exposure to contaminated groundwater.

- Monitoring of groundwater to evaluate contaminant level and identify changes to contaminant plume configuration until remediation levels are achieved.

2.3.3 Amended Selected Remedy

Because of the 1993 removal of 700 cu. yd. of BTEX contaminated soils from the most contaminated area of the site, the level of remaining residual soil contamination does not appear to warrant installation of a bioventing soil treatment system. New information that was not available in September 1995 when the OU 3,4,5 ROD was signed has been considered during the RD for source area ST58. The new information includes groundwater and soil vapor chemistry data collected by EA Engineering in September 1995. The results are shown in Figure 3-18 (OU3,4,5 Draft RD, 1996), and indicate that the BTEX concentrations in the groundwater at the source are present at concentrations approximately an order of magnitude lower than the concentrations presented in the RI/FS and ROD which supported the selection of the in situ alternative over the groundwater monitoring/institutional controls alternative. The O_2/CO_2 data collected in the vadose zone of the source area indicate that the soil vapor does contain relatively low concentration of O_2 and relatively high concentration of CO_2, suggesting that natural respiration of hydrocarbons is occurring. The results of the EA data gap work also indicate that the BTEX plume is less extensive now than it was when the samples were last collected in 1993

(Figures 3-16 & 3-17), and the one well that contained benzene in 1995 (58MW10) had decreased its concentration over an order of magnitude from that of the 1993 sampling. Benzene concentrations are below 100 µg\L, the concentration used for the OU1 and OU2 bioventing remediation efforts to delineate the area to be remediated. Some of the decrease in the size of the dissolved plume is attributed to the removal of some of the hydrocarbon source when 700 cu.yd. of soil was excavated from the former tank pit in 1993 (Liikala & Evans, 1995). However, no soil was removed in the area of the monitoring well 58MW10. This data seems to support the conclusion that both source removal and natural attenuation have significantly reduced the area of the groundwater impacted by benzene at ST58.

Natural attenuation of the hydrocarbons at the source area is occurring based on the groundwater monitoring results collected by EA and based on the results of the testing completed by Utah Water Research Laboratory for the area of ST13/DP26.

Alternative 2, Institutional Controls, will be selected instead of Alternative 3, In Situ. This change could be considered a fundamental change that is a logical outgrowth of data gap work and scoping conducted during the RD.

Additional investigations have indicated that petroleum contamination is being addressed through natural attenuation and biodegradation in both the soils and groundwater; and therefore, the original remedy of bioventing is proposed to be changed as follows: Residual soil contamination does not appear to be adversely impacting the groundwater; therefore, no further action of soils is proposed. For the lead contamination at ST58, the Air Force, EPA, and ADEC have determined that groundwater restoration for this confined area is technically impracticable. Subsequent to the ROD, the Air Force conducted an extensive study of the groundwater lead contamination at the base to determine the form of the lead and to determine if the area of lead contamination was expanding. The study determined that the organic lead originally contained in the fuel has degraded to an immobile, stable inorganic lead that strongly adheres to the soils within the groundwater and consequently, the groundwater contamination is contained within an area approximately 500 feet long. Monitoring data collected during the investigations confirm that the contamination is not expanding. Any remaining source of the more mobile organic lead will be degraded to the immoble, inorganic lead through treatment and removal of the petroleum products. It would be extremely difficult or technically impracticable to clean up the groundwater lead contamination by pumping the groundwater because the lead is so strongly adhered to the soils within the groundwater.

Under the federal Superfund law, when groundwater restoration is technically impracticable, action focuses on: (1) containment to prevent contamination migration; (2) source removal to prevent further contamination of the groundwater; and (3) prevention of exposures. For ST58, the Air Force, EPA, and ADEC have determined that groundwater restoration for this limited area is technically impracticable; and therefore, the original remedy of groundwater extraction/treatment is proposed to be changed to:

- Continued monitoring to confirm that the groundwater lead contamination is not migrating and is remaining within the currently established containment area. Regulatory

requirements would be waived for lead contamination in groundwater within this limited containment area.

- Degradiation of the organic lead to immobile inorganic lead will occur as a result of the degradiation of petroleum contamination through the process of natural attentuation.

- Implementation and enforcement of institutional controls to prevent use of the contaminated soil and groundwater in this area to ensure protection of human health and the environment.

2.4 LF03/FT09 Site History

LF03 is located east of the south end of the runway and north of the refueling loop (see Figure 2.1 in OU3,4,5 ROD). FT09 is located within the west-central part of LF03. LF03 and FT09 are approximately 39.5 hectares (98.8 acres). LF03 was used as the main base landfill from 1967 to 1987. The landfill is believed to have received household garbage, scrap lumber and metal, construction debris, concrete slabs, empty cans and drums from flightline industrial shops, and possible waste oils, spent solvents, and paint residues and thinners. The six trenches on the east side of the landfill received most of the waste after 1980. The landfill excavation reportedly extended below the water table. The landfill boundaries were established by geophysical surveys performed by HLA in 1988 and 1989. Potential sources of contamination include the leaching of landfill debris by groundwater, and subsurface soil and groundwater contamination by leaks from buried drums or cans.

Fire-training exercises at FT09 occurred from 1955 to 1989 and involved burning waste oils, contaminated fuel, and spent solvents. Procedures used during the most recent exercises involved saturating the ground with approximately 20,000 L of water, applying fuel, burning the fuel for 30 seconds, and extinguishing it with foam. A mixture of 2000 to 4000 L of clean JP-4 and up to 800 L of contaminated JP-4 was used in these exercises. Fire-training exercises were conducted at least twice per month. Expected contaminants from FT09 include fuel-related compounds (BTEX) and chlorinated solvents. The mock jet was removed in 1994, and during the summer of 1995 a new lined fire training facility was constructed.

2.4.1 Contamination Problems

Soil contaminants greater than EPA risk-based screening levels or background concentrations for LF03/FT09 are summarized in Table 2.7. Sample results delineated several areas of soil with TPH concentrations greater than 100 mg/kg. An area of surface contamination approximately

30 by 60 m (98.4 by 196.9 ft) was delineated near a mock-up jet fighter used for fire-training exercises. An area of subsurface contamination was identified west of the mock-up jet, at a depth of approximately 1 to 2 m (3.3 to 6.6 ft) below land surface, which is just above the water table. The subsurface TPH contamination may be the result of fire-training activities (such as spilled fuel) or leakage from landfill debris.

As a result of the TPH survey, samples were collected adjacent to the former site of the mock-up jet. PAHs were detected in all of these samples at concentrations ranging from 75 to 410 mg/kg. The greatest number of PAHs was detected in surface soil sample 03SYS05, at the west end of the mock-up jet. In addition, kerosene was detected in all but one sample. Naphthalene and 2-methylnaphthalene, which are commonly found in JP-4 fuel, were detected in two samples. The presence of these compounds may be attributed to incomplete combustion of fuel used in fire-training exercises.

Table 2.6 Surface and Subsurface Soil Contaminants Greater Than Screening Levels, LF03/FT09

Chemical	Detection Limit (µg/kg)	# Analyzed/ # Detected	Concentration Range (µg/kg)	Location of Maximum Detect
1,2 Dichloroethylene	100	10/1	300-300	03M02
Benzo(a)anthracene	660	9/2	84-181	03SYS05
Benzo(a)pyrene	660	9/3	79.1-200	03SYS05
Benzo(b)fluoranthene	660	9/3	83-250	03SYS05
Benzo(ghi)perylene	660	9/1	200-200	03SYS05
Indeno(1,2,3-cd)pyrene	660	9/1	200-200	03SYS05
Kerosene	N/A	10/10	48-1,590,000	03SS09

Groundwater contaminants greater than EPA risk-based screening levels or background concentrations for LF03/FT09 are summarized in Table 2.8. Sampling results, prior to 1994, indicated the presence of VOCs in groundwater at LF03/FT09 (see Figure 8.2 in OU3,4,5 ROD). Leakage from a subsurface JP-4 fuel pipeline approximately 76 m (83 yd) upgradient of Well 03M13 had been cited as a possible source of benzene contamination; however, no toluene, ethylbenzene, or xylene were detected in samples with the highest benzene concentrations. No floating product was encountered. The presence of benzene without the other fuel-related VOCs is characteristic of the leading edge of a plume from an upgradient source because benzene is more mobile than the other constituents. Another possibility is the benzene plume may have originated from a source in the fire-training area. Solvents were also detected in groundwater at LF03, prior to 1994.

Table 2.7 Groundwater Contaminants Greater Than Screening Levels, LF03/FT09

Chemical	Detection Limit (µg/L)	# Analyzed/ # Detected	Concentration Range (µg/L)	Location of Maximum
1,4-Dichlorobenzene	10	79/2	64-82	03M08
Benzene	1	22/4	1.7-20	03M08

Tetrachlorethane (PCE)	0.5	22/1	53-53	03M08
Trichloroethane (TCE)	0.5	22/6	0.64-150	03M08
Vinyl Chloride	0.5	22/5	0.54-17	03M08

Groundwater sampling results in 1989 delineated plumes of trichloroethane (TCE) near Well 03M08 and vinyl chloride near Well 03M01. TCE was not detected in samples collected downgradient of Well 03M08 and, therefore, is probably caused by a localized leak from landfill debris. The plume appeared to have originated near Well 03M01 and extended to the north, toward Garrison Slough. These solvents were most likely derived from leaking containers of spent solvent in the landfill. Low concentrations of solvents were also detected in the 1992 groundwater samples.

By the time of the sampling event in August 1994, benzene and chlorinated solvents were below MCLs (and in many cases below detection limits) in all wells in LF03/FT09 and SS37, except for Well 03M08 (see Figures 8.2 through 8.5) This well contained relatively high concentrations of a number of contaminants (see Table 2.8), including 4-methyl phenol (p-cresol), dichlorodifluoromethane (Freon-11), and trichlorofluoromethane (Freon-12). Analyses were not reported for Well 03M08 in a previous investigation by HLA (1989) because of analytical difficulties. Well 03M08 was not sampled in 1992. This well is located in the eastern portion of LF03 in the area of the waste trenches, which were used after 1980. It is important to note that contaminated groundwater from LF03/FT09 is limited to low concentrations in one well within the landfill refuse. Groundwater concentrations in wells surrounding the downgradient perimeter of the landfill are below regulatory levels.

This data in addition to a more detailed accounting of the sampling history and analytical results can be found in the OU 3, 4,5 ROD and the OU 3,4,5 RI.

2.4.2 The Selected Remedy for LF03/FT09 as Originally Described in the OU 3, 4, 5 ROD

At site LF03/FT09 Alternative 4, Soil Cover/Composite Cap/Groundwater Monitoring/Institutional Controls, was determined to be the most appropriate remedy at the time the OU 3, 4, 5 ROD was signed. FT09 is considered together with LF03, because FT09 is completely contained within LF03.

This alternative was chosen because it is believed that a composite cap was required under RCRA Subtitle C for areas that receive waste after 1980. Groundwater monitoring would be performed at the edge of the waste management area to detect any movement of contaminants.

The cap alternative focused on eliminating the threat of direct contact with buried landfill debris, and on soil contamination and monitoring of groundwater at the edge of the waste management area to ensure that federal and State standards are met.

The primary components of the selected remedy are:

• For the portion of the landfill where disposal occurred before 1980, RCRA Part 264 is relevant and appropriate. Currently, no groundwater at the edge of the waste management area exceeds regulatory levels; the residual contamination poses a direct contact threat. A cover to address the direct contact threat will be installed and maintained in accordance with relevant and appropriate requirements of Part 264. Groundwater at the landfill will continue to be monitored, as appropriate, to verify that contaminant concentrations, if any, remain within acceptable screening levels.

• For the portion of the landfill where disposal occurred after 1980, RCRA Part 264 is applicable. The final cover will be constructed to: (1) provide long-term minimization of migration of liquids, (2) function with minimum maintenance, (3) promote drainage and minimize erosion, (4) accommodate settling and subsidence, and (5) have a permeability less than or equal to the natural subsoil present. Post-closure care, including maintenance and monitoring, will be conducted in accordance with 40 CFR 264.117 and 264.228(b).

• Institutional controls will be implemented to restrict land use. In the event of base closure, any remaining contamination will be addressed in accordance with CERCLA Section 120.

2.4.3 Amended Selected Remedy

No fundamental changes are proposed to the selected remedy; however, clarification of regulatory issues is warranted. The Air Force had previously indicated that there was documented evidence of disposal of hazardous waste in the post-1980 disposal area. A subsequent search of Air Force and Fairbanks North Star Borough records after the signing of the original ROD could not confirm this disposal of hazardous waste. Given the lack of documentation of hazardous waste disposal, RCRA Subtitle C is relevant and appropriate as an ARAR, but is not applicable. Groundwater concentrations are below regulatory levels, therefore, an impermeable cover to prevent movement of groundwater through the landfill is not warranted. The amended selected remedy is clarified as follows:

- A cover to address the direct contact threat will be maintained in accordance with relevant and appropriate requirements of the Resource Conservation and Recovery Act Part 264.

- Groundwater at and adjacent to the landfill will continue to be monitored to verify that contaminant concentrations remain below acceptable regulatory levels.

- Institutional controls will be implemented to restrict land use to prevent direct exposure to landfill waste..

3.0 Summary of Comparative Analysis

The following is a brief discussion evaluating the original selected remedy and the new selected remedy based on the nine criteria presented in the National Contingency Plan (NCP).

3.1 Overall Protection of Human Health and the Environment

3.1.1 Site DP44: Both the original and the amended remedies satisfy this criteria. The amended remedy would use institutional controls to prevent the use of contaminated groundwater at the site until cleanup standards are achieved and would employ long term monitoring. The SVE portion of the original selected alternative will not provide a significantly greater protection of human health and the environment or a significantly greater degree of cleanup of soil and groundwater over biodegradation and natural attenuation, as shown by additional investigation and pilot testing.

3.1.2 Site SS35: Both the original and the amended remedies satisfy this criteria. The amended remedy would employ long term monitoring of surface water, groundwater, sediments, and aquatic organisms to confirm concentrations of contaminants found at the site remain at levels protective of human health and the environment.

3.1.3 Site ST58: Both the original and the amended remedies satisfy this criteria. The amended remedy would use institutional controls to prevent the use of contaminated groundwater at the site and would employ long term monitoring. Because a significant volume of BTEX contaminated soil (700 cu. yd.) was removed from the site in 1993 for a composting demonstration, the limited contaminant source remaining does not appear to be impacting the groundwater and bioventing at this site will not reduce the contaminant levels at a significantly greater rate over natural attenuation and biodegradation, as shown by studies conducted at other sites on the base. Because of the similarity of site conditions and groundwater lead contamination between site ST58 and sites ST13/DP26, the decisions reached at site ST13/DP26 regarding the issue of lead contamination in the groundwater (Technical Impracticability Waiver, and monitoring for lead plume stability) were applied to Site ST58 and are considered protective of human health and the environment. The Air Force will effectively maintain institutional controls in this area in accordance with the Institutional Control Plan while contaminant levels exceed regulatory levels.

3.1.4 Sites LF03 & FT09: Both the original and the amended remedies satisfy this criteria. The amended remedy would employ maintenance of the existing landfill cap to prevent exposure through direct contact with materials buried in the landfill, and institutional controls to restrict land uses. Long term monitoring of groundwater will continue. Because it has been verified that materials buried in the unlined landfill are in contact with the groundwater, and contaminants in the groundwater remain below regulatory levels, the impermeable cover proposed in the original selected remedy is not considered to provide a greater level of protection to human health and the environment than the existing soil cover in place.

3.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

The ARARs for the amended selected remedy are the same as those for the original remedy for all source areas.

3.2.1 Site DP44: The amended remedy is expected to achieve groundwater maximum contaminant goals presented in the original ROD.

3.2.2 Site SS35: The amended remedy complies with all ARARs presented in the original ROD.

3.2.3 Site ST58: The amended remedy is expected to achieve groundwater maximum contaminant goals presented in the original ROD, with the exception of the action level for lead. ARARs for lead contamination in the groundwater at this site have been waived under conditions of the Technical Impracticability Waiver (TIW) from an engineering perspective..

3.2.4 Sites LF03 & FT09: The amended remedy complies with all ARARs presented in the original ROD.

3.3 Long-term Effectiveness and Permanence

3.3.1 Site DP44: Natural attenuation of hydrocarbon and solvent contaminants in groundwater has been shown through study at Eielson AFB to aggressively degrade these type compounds. The amended remedy also prevents use of contaminated groundwater at the site through use of Institutional Controls. Once groundwater MCLs are met, long-term effectiveness and permanence will be achieved.

3.3.2 Site SS35: Contaminants found in surface waters , sediments, and aquatic organisms on this site are not at levels which pose an unacceptable risk to human health and the environment. Long term monitoring of surface water, sediments, and aquatic organisms will continue to ensure long-term effectiveness and permanence.

3.3.3 Site ST58: Natural attenuation of hydrocarbon contaminants in groundwater has been shown through study at Eielson AFB to aggressively degrade these type compounds. In addition, organic lead in groundwater at the site is expected to degrade to the immobile inorganic phase. The alternative also prevents use of contaminated groundwater at the site through use of Institutional Controls.

3.3.4 Sites LF03 & FT09: The amended remedy will prevent digging into the landfill waste and is effective in isolating the landfill contents. Enforcement of the site Institutional Controls will ensure long-term effectiveness and permanence of the selected alternative.

3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

3.4.1 Site DP44: Low levels of soil contamination remaining at this source area do not meet the definition of principal threat. The amended remedy for DP44 does not meet the statutory preference for treatment as a principal element. Treatment was not practicable due to the relatively low levels of contamination remaining.

3.4.2 Site SS35: The selected alternative does not include treatment, as the levels of contaminants at this site do not pose an unacceptable risk to human health and the environment.

3.4.3 Site ST58: Low levels of soil contamination remaining at this source area do not meet the definition of principal threat. The amended remedy for ST58 does not meet the statutory preference for treatment as a principal element. Treatment for the organic contamination in soil was not practicable due to the relatively low levels of contamination remaining.

Treatment of the lead contamination in the groundwater is technically impracticable from an engineering perspective.

3.4.4 Sites LF03 & FT09: The selected alternative does not include treatment of the waste because of the low contaminant concentrations and the large volume of waste. The investigation did not identify "hot spots" of soil or groundwater contamination suitable for treatment within this large landfill.

3.5 Short-Term Effectiveness

3.5.1 Site DP44: Natural Attenuation is not a short-term cleanup process, and will achieve cleanup standards much more slowly than active remediation techniques. Neither the amended remedy or the original remedy pose an unacceptable risk to residents or workers during implementation. All potential impacts from construction and system operations will be controlled using standard engineering controls and practices.

3.5.2 Site SS35: Levels of contaminants at this site do not pose an unacceptable risk to human health and the environment.

3.5.3 Site ST58: Natural Attenuation is not a short-term cleanup process, and will achieve cleanup standards much more slowly than active remediation techniques. Neither the amended remedy or the original remedy pose an unacceptable risk to residents or workers during implementation. All potential impacts from construction and system operations will be controlled using standard engineering controls and practices.

3.5.4 Sites LF03 & FT09: Neither the amended remedy or the original remedy pose an unacceptable risk to residents or workers during implementation. All potential impacts from construction and system operations will be controlled using standard engineering controls and practices.

3.6 Implementability

3.6.1 Site DP44: Institutional Controls and long-term monitoring are readily implementable and can be be effectively maintained on this Air Force base.

3.6.2 Site SS35: Long-term monitoring of surface water, sediments, and aquatic organisms is readily implementable.

3.6.3 Site ST58: Institutional controls and long-term monitoring are readily implementable and can be be effectively maintained on this Air Force base.

3.6.4 Sites LF03 & FT09: Institutional controls and long-term monitoring are readily implementable and can be be effectively maintained on this Air Force base.

3.7 Cost

3.7.1 Site DP44:

	Original Alternative Cost ($000)	New Alternative Cost ($000)
Soil Vapor Extraction	1,600	0
GW Monitoring/ICs	140	140
Total Cost	**1,740**	**140**

3.7.2 Site SS35:

	Original Alternative Cost ($000)	New Alternative Cost ($000)
Soil cover	40	0
Surface Water/ Sediment/ Aquatic Org. Monitoring	140	140
Total Cost	**180**	**140**

3.7.3 Site ST58:

	Original Alternative Cost ($000)	New Alternative Cost ($000)
Bioventing System	51	0
GW Monitoring/ICs	140	140
Total Cost	**191**	**140**

3.7.4 Sites LF03 & FT09:

	Original Alternative Cost ($000)	New Alternative Cost ($000)

Soil cover & components	7100	0
GW Monitoring/ICs	230	230
Total Cost	**7,330**	**230**

3.8 State Acceptance

The State of Alaska Department of Environmental Conservation (ADEC) concurs with the actions proposed in this ROD amendment.

3.9 Community Acceptance

No public comments were received, regarding the Proposed Plan, during the public meeting held May 23, 1996, or during the public comment period from May 13, 1996 through June 12, 1996. Community participation is discussed in Section 8.0, Responsiveness Summary.

4.0 Technical Impracticability of Groundwater Restoration

4.1 Specific ARARs

The specific ARAR or media cleanup standards for which the TI waiver applies are as follows:

- MCLs and maximum contaminant level goals (MCLs, non-zero maximum contaminant limit goals [MCLGs], and action levels) established under the *Safe Drinking Water Act* for groundwater that may be used for drinking water supply (40 CFR 141 and 18 AAC 80).

The TI waiver will apply only to lead in the groundwater and specifically to the EPA established action level of 15 ug/L for lead in drinking water.

4.2 Spatial Extent of TI Waiver

The TI waiver will apply to the area having the following boundaries (see Figure A).

- Wabash Avenue on the east
- Division Street on the south
- Flightline Avenue on the west
- A line running east and west along the south side of the Air National Guard operations building #3129.

The vertical extent of the TI waiver will range from the water table to 30 feet below the average annual water table depth.

4.3 Conceptual Model

4.3.1 Site Conditions

The information presented below is from the ITIR for Site ST13/DP26. Because of the similarity in site conditions and lead contamination between Site ST58 and Site ST13/DP26, the U.S. Air Force, EPA, and ADEC agree that conclusions reached in the ITIR for Site ST13/DP26 can be applied to Site ST58. The information presented below is from the ITIR, as follows:

The site lithology is generally homogeneous and is predominantly sand and gravel with very thin discontinuous layers of silt encountered in less than ten percent of site lithological samples (U.S. Air Force 1996 page 5-1). The depositional environment consists of fluvial and glacial fluvial deposits. Most of the sediments were deposited in the principal stream beds during higher energy deposition. The thickness of the alluvial fan deposits are in the hundreds of feet.

The water bearing zone is characterized by a low hydraulic gradient and highly transmissive aquifer materials. The mean hydraulic gradient is 0.002 with the highest (0.05) occurring during a four week period in May and the lowest (0.0013) occurring over a seven month period from September to March (U.S. Air Force 1996 page 5.2). A hydraulic conductivity value of 380 feet/day was estimated from an August 1995 pumping test (U.S. Air Force 1996 page 5.1). The aquifer has a slow vertical rate of mixing which serves to confine groundwater contaminants near the water table (U.S. Air Force 1993b, page 4.1).

4.3.2 Fate and Transport Investigation

The investigation indicates that the major source of lead contamination is from the floating product plume as shown in Figure 2. The lead plume is confined to a small area north of the above ground storage tanks at DP26 and appears to coincide with the historic extent of the floating product plume. During the investigation, tetraethyl lead (TEL), the organic lead fuel additive, was detected in a floating product sample at a level of 319,000 ug/L and at low levels in the groundwater, i.e., 6 ug/L (page ES-3). The groundwater TEL plume was coincident to that of inorganic lead. The investigation also established that the lead contamination is confined to depths between 5 and 30 feet below ground surface (page 5-3).

A RANDOM WALK model predicted that the lead could migrate 50 feet in 500 years (page 5-9). The report qualified this prediction, however, stating that, because of the uncertainty associated with predicting lead transport, conservative input parameters (Retardation Factor $R_f = 166$, page 5-6) were used which demonstrate that the plume will not move appreciably in 100 years and that the concentrations will have diminished substantially at the core (page 5-23). The report also points out that the lead plume has not migrated over the time period for which lead in groundwater data are available (1988 through 1995) (page ES-3). Associated lead transport modeling indicated that aquifer restoration would require approximately 100 years. This prediction is also very uncertain for the reasons Stated above.

4.3.3 EPA Technical Review

In a technical review of the report, EPA indicates that the following report conclusions are valid (see Appendix E, US Air Force 1996 page ES-1).

- The source of the lead is the leaded fuel leaked from the USTs and the associated fuel hydrant system as well as unknown buried fuel tank sludge.
- Lead was transported with the fuel product in the vadose zone and on the water table.
- Organic lead in the fuel product has degraded to inorganic lead which is strongly adsorbed to the vadose zone and aquifer matrix.
- The groundwater lead plume has not migrated over the time period for which lead in groundwater analytical data are available.

The reviewers, however, did not agree with the use of the RANDOM WALK model presented in the report. The model significantly overStated the mobility of lead in groundwater and the model uncertainties are so high that the model results cannot be used to make risk management and remediation decisions (page 5).

A conceptual model, based on empirical data, is represented in figures 3 and 4. In the model, advection refers to the transport and dispersion of lead contamination by the groundwater. As the petroleum hydrocarbons with TEL and inorganic lead are dissolved in the groundwater, the TEL is degraded to inorganic lead relatively quickly through physical, chemical and biological processes. The report indicates that TEL has a half life of 2 to 8 weeks (page 4-10). When the conversion occurs, the inorganic lead has a very strong tendency to sorb onto organic matter and the soil matrix. At this point the inorganic lead is nearly immobilized.

Initially, because migration of the lead is retarded, the BTEX plume may expand beyond the limits of the lead contamination plume. After the fuel source is removed and biodegradation continues to act on the fuel, the size of the fuel plume will decrease with time. As the TEL is transformed to inorganic lead, it is fixed in place. The size of the area contaminated by lead will not decrease and the lead will not move with the groundwater.

In fact, the BTEX plume at ST13 and DP26 has expanded beyond the extent of the lead plume by a significant amount and has begun to decrease in size (U.S. Air Force 1996 page 2-7). The air injection system operation which began in October 1995 is intended to remove the BTEX contaminant source and is expected to accelerate reduction of the BTEX plume. This activity will also accelerate the organic lead degradation rate and the resultant sorption of inorganic lead.

4.4 Evaluation of Restoration Potential

4.4.1 Source Control Measures

The 1988 removal of the four 25,000 gal. above-ground storage tanks and associated piping used for the storage and handling of leaded and unleaded motor gasoline (MOGAS) and diesel removed the primary source of fuel and lead contamination at the site. Motor gasoline (MOGAS) and diesel stored and used at the Quartermaster Service Station appears to have been spilled or leaked from the piping and diesel tanks during operations at the facility. In 1993, approximately

700 cu.yd. of fuel contaminated soil was removed from the most highly contaminated area of the site and used in a composting study (U.S. Air Force, Operable Units 3,4, and 5 Final Record of Decision, September 1995, page 7.11). All contaminants detected at ST58 are in the aqueous form, with no floating product encountered at the site (U.S. Air Force, Operable Units 3,4, and 5 Final Record of Decision, September 1995, page 7.12). After decommissioning of the Quartermaster Service Station in 1988, no fuels have been stored at this site.

Restoration of the site is constrained by the mobility of the lead. Modeling efforts predict that a pump and treat system will require greater than 100 years to remove the lead contamination. The report concludes that lead is largely immoblile in the subsurface and that contamination cannot be cleaned up using pump and treat technology.

No cleanup technology is available that will significantly reduce the time required to restore the aquifer. Soil excavation to remove the residual contamination is not practical because the majority of the contamination is within the saturated zone (U.S. Air Force 1994).

4.4.2 Restoration Timeframe

The modeling effort predicted that restoration of the site using pump and treat technology could require 100 years or more and suggested that this estimate is conservative and the time could be significantly longer. The EPA review also Stated that the lead is relatively immobile and cannot be cleaned up using pump and treat technology.

5.0 Institutional Controls

As part of the institutional controls for contaminated soil and groundwater, the Air Force will develop a written, installation-wide plan ("Institutional Control Plan" or "IC Plan") that sets out procedures to assure that institutional controls for soil and groundwater are developed, maintained, monitored, and remain effective. The IC Plan will be completed within six months of the signature of the ROD amendment and will apply to all areas on the base, including those listed in this ROD Amendment, requiring institutional controls for soil and groundwater as part of the remedy. The IC Plan will be reviewed and approved by EPA and the State of Alaska and is enforceable jointly or severally by them.

The IC Plan shall specify the following:

1.) Eielson AFB will undertake, at a minimum, the following:
   a. identify all areas under restriction or control;
   b. identify the objectives that must be met by the restrictions and controls;
   c. identify the current and future land users, including, at a minimum, but not limited to, lessees, contractors, employees, agents, assigns, invitees, and licensees. In areas where the installation is aware of routine trespassing, the Air Force will also consider trespassers.

2.) Eielson AFB will establish an Institutional Control ("IC") process to develop Standard Operating Procedures (SOPs), incorporated into the Base General Plan (or equivalent document) to ensure IC development, implementation, and enforceability for each area which has an IC as a component of the selected remedy.

a. Eielson AFB shall consider, and demonstrate to EPA and the State, that the IC process will cover all entities and persons necessary, including, but not limited to, lessees, contractors, employees, agents, licensees, trespassers, and invitees.

b. Eielson AFB shall consider and demonstrate to EPA and the State that the IC process will cover all activities, including, but not limited to any and all, routine and non-routine utility work, soil disturbance, groundwater withdrawals, well placement, drilling, paving, troop training exercises, recreation uses, building, renovation work on structures or other activities.

c. Eielson AFB shall specify (e.g., through the SOPs) the particular restrictions, controls and mechanisms which will be used to achieve the identified objectives.

d. Eielson AFB shall include a data base and master installation map that identifies all land areas under restriction or control, the objectives to be met by the restrictions or controls, and the particular restrictions, controls and mechanisms which will be used to achieve the identified objectives.

e. Eielson AFB shall develop a process to ensure that both EPA and State approval, as appropriate, are obtained prior to any change in identified land use designation, restrictions, land users or specific activity for any IC required.

3.) The IC Plan will specify that all current or future land users, whether government or private entities, will be legally required to abide by the decision document and the IC contained therein, and specify the enforcement mechanism or tool that will legally bind the land user (e.g. leases, licenses, contracts, command directives, etc.).

4.) Eielson AFB shall identify the "point of contact" person or organization designated as being responsible for implementing, monitoring, maintaining and enforcing the IC process.

5.) Eielson AFB shall identify the source of funding for activities required by the IC process at the installation.

6.) Eielson AFB will monitor compliance with all aspects of the IC process on an annual basis throughout the period of time necessary to implement and maintain the applicable IC, unless another monitoring frequency is agreed to by EPA and the State.

7.) Eielson AFB shall conduct field inspections, at least annually, to assess the condition of all areas at the installation subject to IC. These inspections will be used in determining the effectiveness and protectiveness of all IC and designated land uses, and will be used in

ascertaining whether the current land and groundwater uses in the areas are consistent with the IC for all remediation objectives outlined in the decision document governing that area. The results of any field inspections shall be documented in a field inspection report, which shall be sent to EPA and the State within 60 days of the completion of the field inspection. The designated official responsible for the facility operations shall certify the accuracy of the field inspections and the continued compliance with all IC requirements. Eielson AFB shall provide notice of any change in the designated official to EPA and the State.

8.) Eielson AFB shall notify EPA and the State immediately upon discovery of any unauthorized change in an IC, in land use designation(s), or in any activity which is inconsistent with the identified IC. Eielson AFB will allow EPA and the State upon notification to work with the installation to determine a plan of action to resolve the unauthorized change/activity. Where the Air Force believes the unauthorized change creates an emergency situation, the Air Force can respond to the emergency upon notification to EPA and the State and need not await EPA or State input to determine a plan of action. Eielson AFB will develop a "feedback loop" to identify what went wrong with the IC process, identify how to correct the process to avoid future problems and requires the correction to be implemented.

9.) Eielson AFB shall notify EPA and the State at least six (6) months prior to, when possible, but no later than thirty (30) days prior to, any transfer, sale or lease of any property interest at the installation and define in the notification the process to be utilized to ensure IC remain in place, remain effective and remain enforceable.

10.) The IC Plan, and in particular, the IC process developed and implemented under that Plan, shall be reviewed as a part of the CERCLA five year review process.

11.) The removal of IC, completion of IC, or no further need for IC must be a coordinated decision with approval by EPA and the State. In the event of a disagreement, the parties will resolve the dispute in accordance with Part XXI, Resolution of Dispute, of the Eielson Air Force Base Federal Facility Agreement.

6.0 Affirmation of Statutory Determinations

The amended selected remedies are protective of human health and the environment and are cost effective. The amended selected remedies comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action with the exception of the action level for lead established under the Safe Drinking Water Act (40 CFR 141.80). A waiver of the lead action level is justified because compliance with the requirement is technically impractical from an engineering perspective. The remedies utilize permanent solutions and alternate treatment (or resource recovery) technologies to the maximum extent practicable and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because these remedies will result in hazardous substances remaining onsite above health-based levels, reviews will be conducted at sites ST13 and DP26 within 5 years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

7.0 Responsiveness Summary

The proposed ROD amendments and TI waiver considered by the U.S. Air Force, ADEC, and EPA were presented to the public in The Proposed Record of Decision Amendments for Operable Unit 2 and Operable Units 3, 4, 5 which was released to the public in May 1996 and discussed in a public meeting on 23 May 1996. The proposed ROD amendment document outlined proposed changes to the selected remedies for addressing soil and groundwater contamination in the Records of Decision for OU 2 and OU 3, 4, 5. The public comment period for the Proposed Plan was from May 13 to June 12, 1996.

These sections follow:

- Background on Community Development
- Summary of the Comments Received During the Public Comment Period and USAF Responses
- Remaining Concerns

7.1 Background on Community Involvement

Prior to the addition of Eielson AFB to the EPA National Priority List in 1989, the community was offered little opportunity for involvement in environmental activity. From 1982 until 1989, the USAF used the Installation Restoration Program (IRP) to identify potential contaminated areas and investigate what remedial actions might be required. This process was purely technical and did not evaluate community concerns in the decision-making process. However, after signing a Federal Facility Agreement with the State of Alaska and the EPA in 1991, the Air Force began its Superfund clean up program, which does include extensive community involvement.

A Technical Review Committee (TRC), established in 1992, included three representatives from the community (selected by local officials and the University of Alaska Chancellor), industry representatives, and environmental representatives. Many of the TRC participants are members of the professional public. The TRC was converted to a Restoration Advisory Board (RAB) in the Spring of 1995. Three community representatives were selected as RAB co-chairpersons, one each from the communities of Salcha, Moose Creek, and North Pole, Alaska. The RAB met during the public comment period on May 23, 1996 to review the proposed ROD amendments.

The public comment period, public meeting, and proposed amendment changes for OUs 2, 3, 4, and 5 were advertised twice in two local newspapers. The advertisement appeared in the Fairbanks Daily News-Miner on May 12, 1996 and in the Goldpanner on May 17, 1996.

Proposed ROD Amendments were mailed to more than 150 people on the clean up mailing list on May 13. In addition, members of the RAB and 354 CES/CEVR created a short informational commercial which was aired as a public service announcement thirteen times prior to the public meeting on local television channels 2, 4, and 11. The Administrative Record is available for public review at the areas identified in Section 1.5.

7.2 Summary of Comments Received During the Public Comment Period and USAF Responses

A public meeting was held on May 23, 1996 at the North Pole City Hall in North Pole, Alaska. Approximately 25 people attended the meeting, including representatives of the Air Force, EPA, ADEC, and the public. The public comment period on the proposed ROD amendments extended from May 13 through June 12, 1996. There were no formal verbal comments received during the public meeting or during the public comment period.

8.0 References

Harding Lawson Associates (HLA). 1989. *Installation Restoration Program Remedial Investigation/Feasibility Study, Stage 3, #2, Eielson Air Force Base, Alaska. Volume III, Draft Remedial Investigation/Feasibility Study (July 1988-April 1989, Chapter IV.* Ad. Record 1390, Prepared by Harding, Lawson Associates for the Alaskan Air Command, Elmendorf Air Force Base, Alaska.

Harding Lawson Associates (HLA). 1990. *Installation Restoration Program Remedial Investigation/Feasibility Study, Stage 4, Draft Report for Eielson Air Force Base, Alaska. Volume I through V.* Prepared by Harding, Lawson Associates for the Alaskan Air Command, Elmendorf Air Force Base, Alaska.

Liikala, T. L., and J. C. Evans. 1995. *Field Investigation, Source Area ST58, Old Quartermaster Service Station, Eielson Air Force Base, Alaska.* PNL-10358, Pacific Northwest Laboratory, Richland, Washington.

Shannon & Wilson. 1991. *Geotechnical Investigation and Foundation Study Vehicle Maintenance Facility Air National Guard Eielson Air Force Base, Alaska.* Shannon & Wilson, Inc. Fairbanks, Alaska.

Shannon & Wilson. 1992. *Final Report Alaska Air National Guard UST Removal Building 6128, Eielson Air Force Base, Alaska.* Shannon & Wilson, Inc. Fairbanks, Alaska.

U.S. Air Force. 1993b. *Eielson Air Force Base OU-2 Remedial Investigation/Feasibility Study: Remedial Investigation Report.* Eielson Air Force Base, Alaska.

U.S. Air Force. 1994b. *Source Evaluation Report Phase 2 Investigation Limited Field Investigation Final Report.* Eielson Air Force Base, Alaska.

U.S. Air Force. 1995. Environmental Restoration Program, *Sitewide Biological Risk Assessment* (Final), Eielson Air Force Base, Alaska.

U.S. Air Force. 1995. *Operable Units 3,4, and 5 Record Of Decision* (Final), Eielson Air Force Base, Alaska.

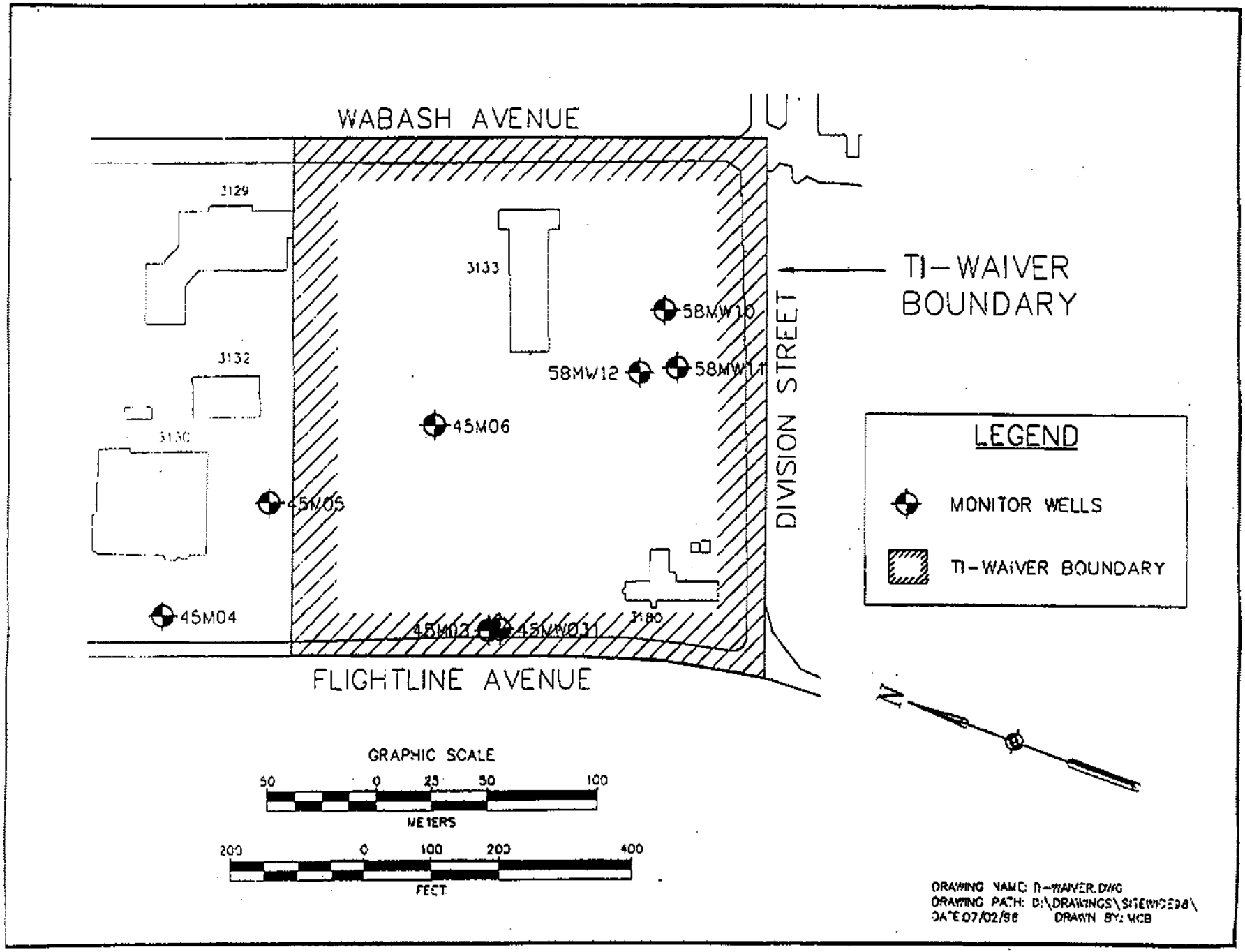
U.S. Air Force. 1995a. Environmental Restoration Program, *Operable Units 3,4, and 5 Remedial Investigation Report* (Final), Eielson Air Force Base, Alaska.

U.S. Air Force. 1995b. Environmental Restoration Program, *Operable Units 3,4, and 5 Baseline Risk Assessment* (Final), Eielson Air Force, Alaska.

U.S. Air Force. 1995c. Environmental Restoration Program, *Operable Units 3,4,and 5 Feasibility Study* (Final), Eielson Air Force Base, Alaska.

U.S. Air Force. 1996. *Eielson Air Force Base Operable Unit 2, Source Areas ST13/DP26, Treatability Study Informal Technical Information Report.* Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas.

U.S. Air Force. 1996. *Operable Units 3,4, and 5, Conceptual Design,* Eielson Air Force Base, Alaska.



ST58: TI-Waiver Boundary, Eielson AFB, Alaska

CONCEPTUAL SITE MODEL

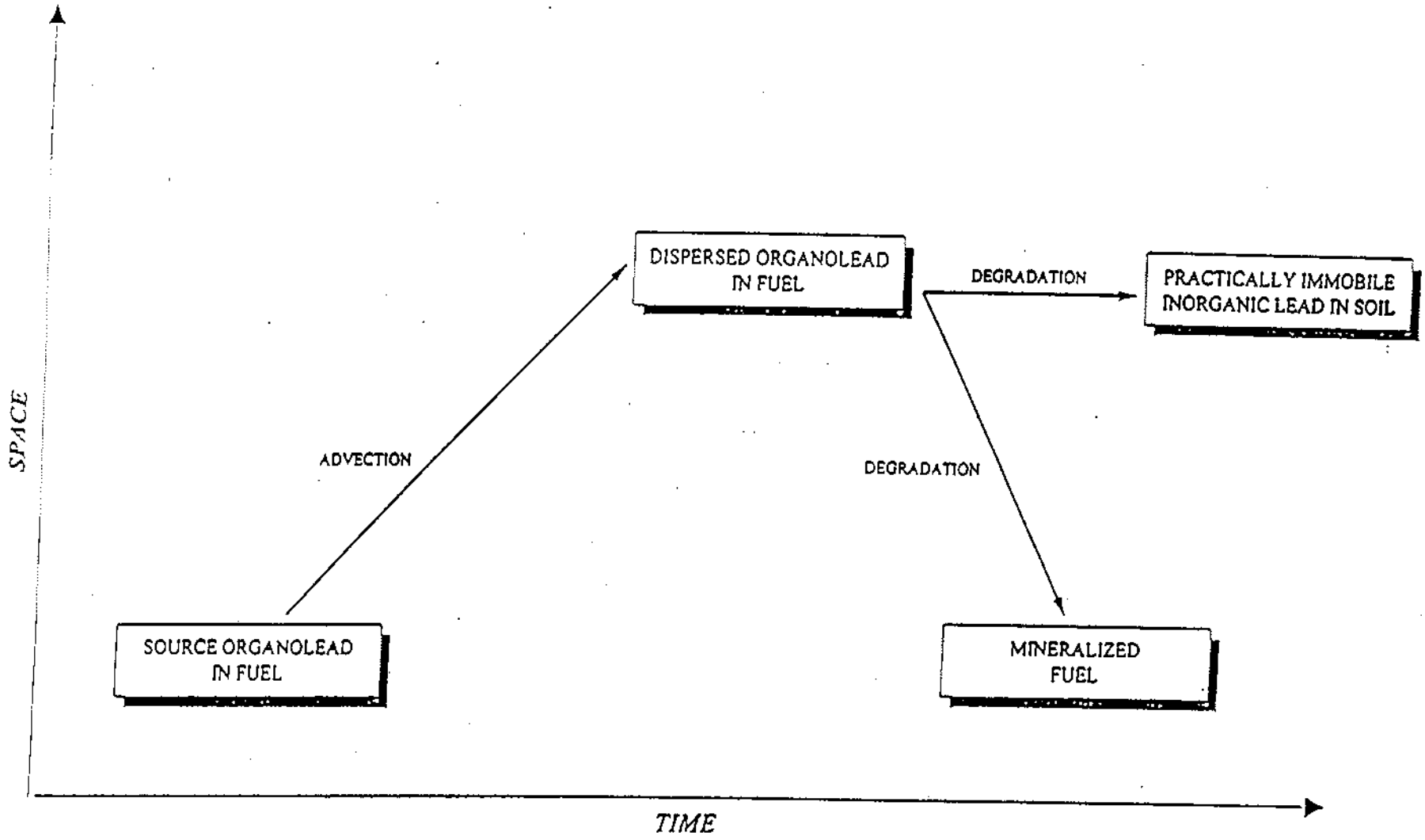


FIGURE 1
CONCEPTUAL SITE MODEL
EIELSON AIR FORCE BASE

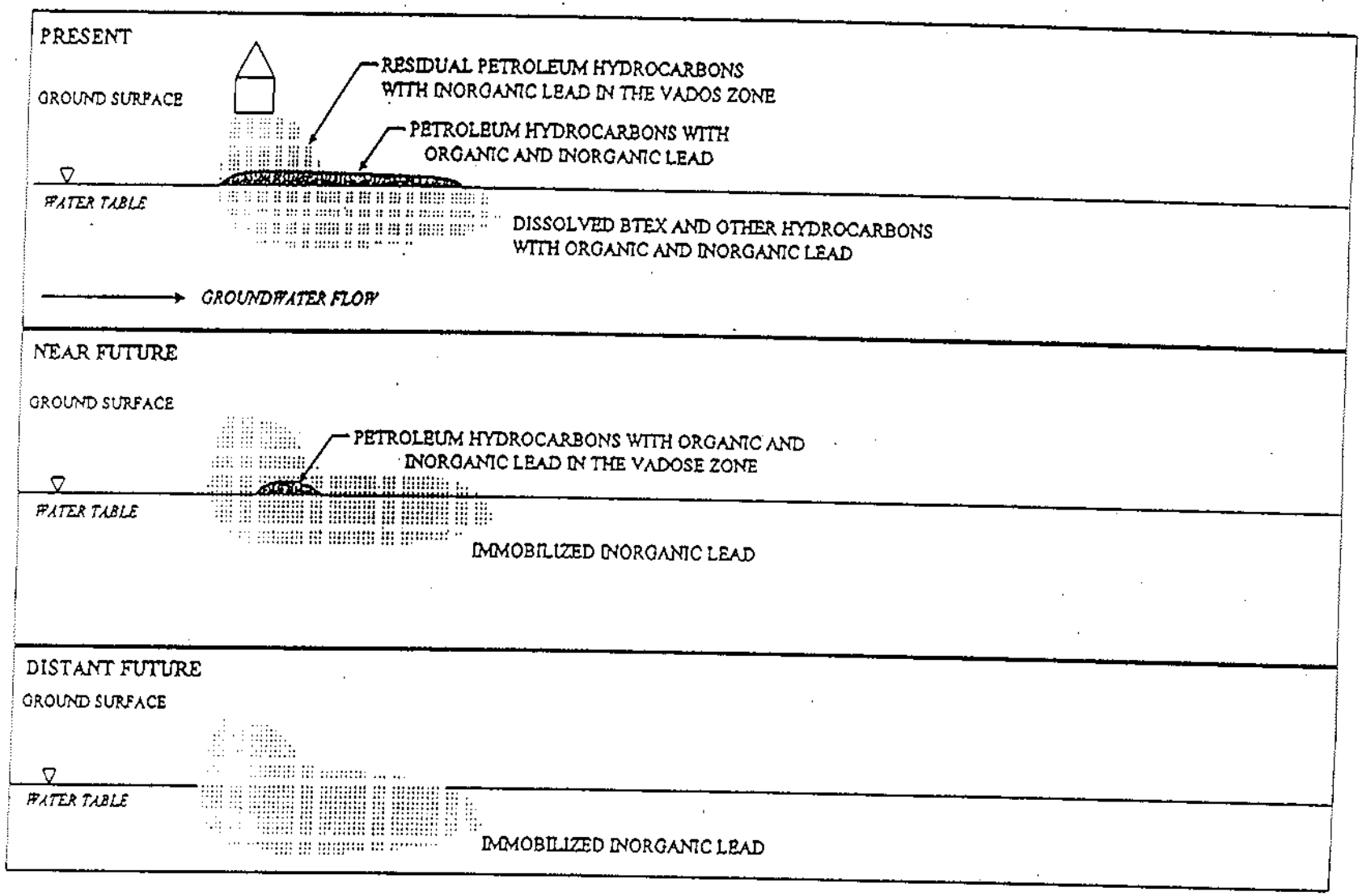


FIGURE 2
CONCEPTUAL SITE MODEL
EIELSON AIR FORCE BASE