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EIELSON AIR FORCE BASE
ALASKA

ENVIRONMENTAL RESTORATION

FIVE-YEAR REVIEW

September 1998

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this five-year review is to ensure that remedial actions selected in the Records of Decision for Operable Units (OUs) 1 through 6 and the Sitewide Operable Unit at Eielson Air Force Base (AFB) remain protective of public health and the environment and are functioning as designed. The start of construction of the OU1 Interim Remedial Action triggered this periodic (five-year) review requirement. The scope of this review covers selected remedies at all of the OUs and is considered a Type Ia review in accordance with the Environmental Protection Agency (EPA) OSWER Directive 9355.7-02A (July 26, 1994).

1.2 Authority Statement

The United States Air Force (USAF) has conducted this review pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC 9621(c), the National Contingency Plan (NCP) - 40 CFR 300.400(f)(4)(ii), Executive Order 12580 (January 23, 1987), and the Federal Facility Agreement (FFA) for Eielson AFB (May 1991). This document is consistent with the following EPA guidance documents: OSWER Directive 9355.7-02 (May 23, 1991) as supplemented by OSWER Directives 9355.7-02A (July 26, 1994) and 9355.7-03A (December 21, 1995). As directed by the FFA, the project managers for the EPA and the State of Alaska Department of Environmental Conservation (ADEC) have participated in this review. This review is limited to only those sites being remediated under CERCLA authority.

In conducting this five-year review of whether the Remedial Actions at Eielson AFB remain protective of public health and the environment and are functioning as designed, the project team first met to scope the review. Certain issues (institutional controls (ICs), groundwater monitoring, and overall protectiviness) were considered site-wide, otherwise this review was completed on an Operable Unit (OU) basis. For Basewide issues and each OU, the project team reviewed and evaluated the Records of Decision requirements, the work that has been done to satisfy those requirements, current and past monitoring data, and the current status of the remedies and the physical conditions of the sites. This evaluation included visits to each OU where action has been performed or is in progress. Review of the OUs was done concurrent with preparation of the Remedial Action Summary (RAS) Reports. These reports include a detailed description of the remedial actions, monitoring data, and evaluation of data trends and progress toward cleanup goals for each OU. This five-year review was then drafted based on the evaluations provided in the RAS Reports. The five-year review and RAS report processes were presented to the Eielson Restoration Advisory Board (RAB) during a public meeting in July 1998. A fact sheet describing these processes was distributed to the public during the RAB meeting, posted on the Eielson AFB Internet web-site, and placed in the administrative record.

1.3 Installation Description

Eielson AFB covers approximately 19,700 acres. It is located along the Richardson Highway within the Fairbanks North Star Borough, approximately 24 miles southeast of Fairbanks and 10 miles southeast of the city of North Pole, Alaska (Figure 1). Approximately 3,650 acres are improved or partially improved with the remaining land encompassing forest, wetlands, lakes, and ponds. The Base employs approximately

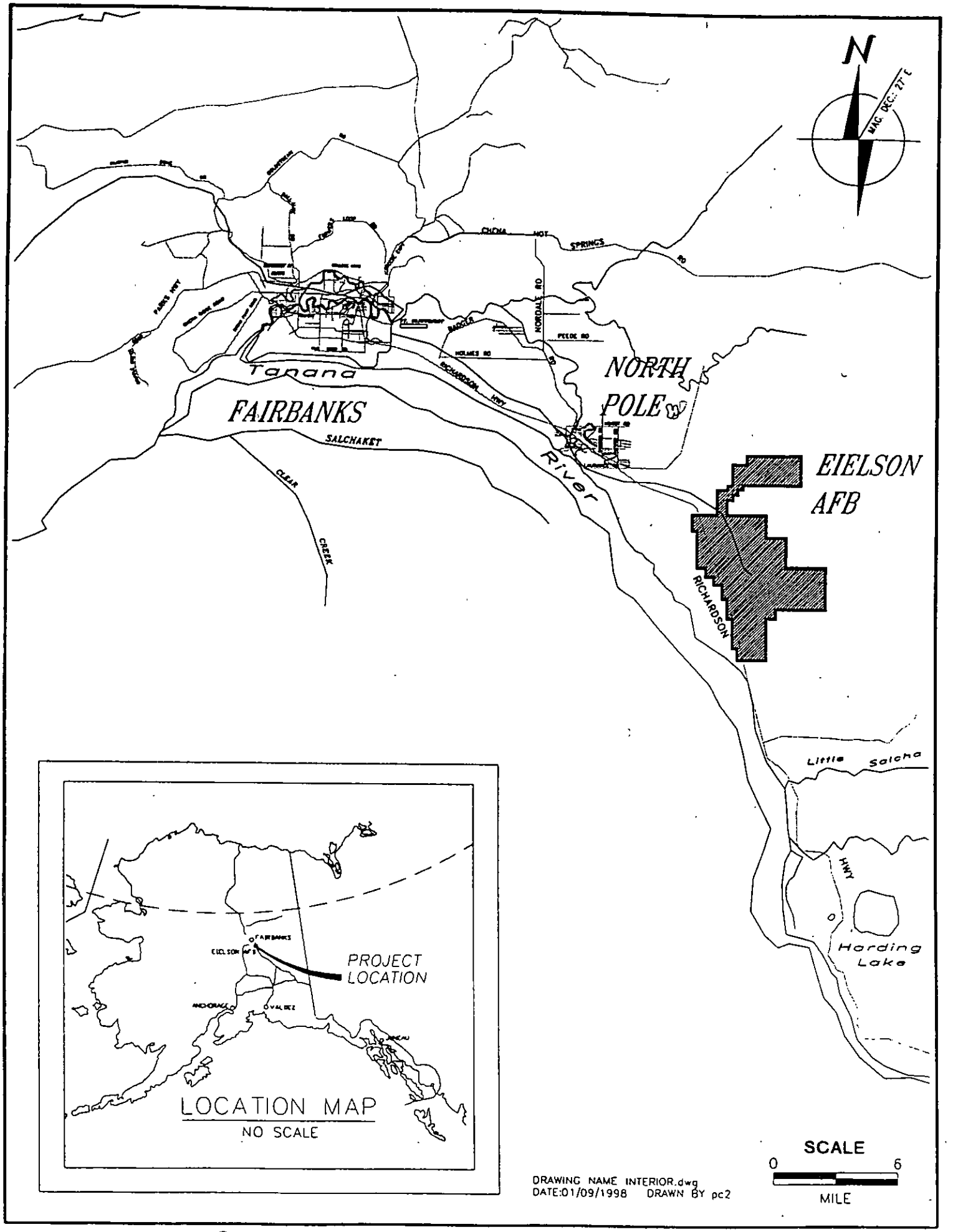

Figure 1 Eielson Air Force Base Location Map

3,400 military personnel and 500 civilians. The total residential population of Eielson AFB is approximately 5,100. Residential and occupational populations are primarily concentrated in the developed portion of the Base.

Since its establishment in 1944, the mission of Eielson AFB has been to train and equip personnel for close air support of ground troops in an arctic environment. Operations at Eielson AFB have generated varying quantities of hazardous and non-hazardous wastes from industrial and airfield operations, fire training, and fuels management. On November 21, 1989, the EPA listed Eielson AFB on the National Priorities List (NPL). This listing designated the facility as a federal Superfund site subject to the remedial response requirements of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA).

In May 1991, the USAF, the State of Alaska, and the EPA entered into the FFA, under CERCLA Section 120, which established the procedural framework and schedule for developing, implementing, and monitoring CERCLA response actions. An additional goal of the FFA was to integrate the USAF's CERCLA response obligations and Resource Conservation and Recovery Act (RCRA) corrective action obligations. Under the FFA, potential source areas were either grouped into six OUs Based on similar contaminant and environmental characteristics, or were included for evaluation under a source evaluation report (SER). The Sitewide study followed the investigations under separate OUs to evaluate any cumulative risks at the base.

1.4 Physical Site Characteristics

1.4.1 Geology

The bedrock below Eielson AFB is exposed in the uplands and consists predominantly of Precambrian and Late Paleozoic age quartz-mica schist (termed Birch Creek schist) with some Mesozoic age intrusives. The regional bedrock is overlain by accumulations of unconsolidated fluvial and glacial fluvial sediment derived from the Alaska Range during the Quaternary period. Unconsolidated sediments beneath Eielson AFB are approximately 200 to 300 feet thick and consist of glacial outwash and alluvial stream sediments deposited by the braided Tanana River system. These unconsolidated deposits typically occur as interbedded layers of well-graded sand and gravel with cobbles up to eight inches in diameter. These deposits are often reworked and remixed by the depositional dynamics of the braided river system. The silt content varies but is generally less than 10 percent.

Surficial deposits over most of the Base consist primarily of a sandy gravelly loam. Silty airborne deposits (loess) occur in some of the eastern and upland areas. Surficial soils in many developed areas of the Base consist of sand and gravel fill mined from on-Base borrow pits. Soils near main streams are gravelly, and soils located further away from the main streams are generally more silty.

The undeveloped portions of Eielson AFB are underlain by semi-continuous permafrost. Permafrost is more likely to be present in silty than in gravelly soil, such as the area between French Creek and the upland area of the eastern portion of the Base. On-Base surface water bodies and developed areas are seldom underlain by permafrost as these areas are thermal sources that degrade permafrost.

1.4.2 Groundwater

An extensive regional aquifer system occurs within the unconsolidated alluvial/glaciofluvial deposits in the broad valley of the Tanana River. This aquifer is about 45 to 50 miles wide at Eielson AFB and is about 200 to 300 feet thick. The aquifer consists primarily of interbedded layers or lenses of unconsolidated sand and gravel. The occurrence of groundwater in the underlying Precambrian bedrock is not well defined.

No distinct aquitard units have been identified within the unconsolidated deposits. One deep well near the central heating and power plant is known to have encountered a 20-foot-thick silt layer 115 to 135 feet below ground surface. The lateral extent, continuity, and hydraulic properties of the silt unit are unknown. Groundwater on Eielson AFB is primarily unconfined or semiconfined. Semi-confined groundwater would be expected in areas containing permafrost, such as in the undeveloped portions of the Base that are not in the immediate vicinity of surface water bodies.

Regional groundwater generally flows north-northwest, parallel to the Tanana River; however, the direction and gradient of groundwater flow may be locally influenced by 1) buried stream channels in which the hydraulic conductivity is greater than the surrounding sediment, 2) local surface drainages, and 3) zones of permafrost. Depth to the water table is typically less than 10 feet. The horizontal hydraulic gradient within the developed portion of the Base averages four to six feet per mile and can reach 13 feet per mile.

The vertical hydraulic gradient within the aquifer is unknown given the lack of representative water level data from the deep wells on-Base. Primary sources of recharge to the aquifer include the Tanana River, its tributaries, and vertical percolation of rainfall and snowmelt.

1.1.3 Surface Water

Surface-water bodies in the vicinity of Eielson AFB include rivers, creeks, sloughs, lakes, ponds, and wetlands. Eielson AFB is about two miles east of the Tanana River, a major braided stream draining interior Alaska. The Tanana River drainage basin is about 44,000 square miles in size. Surface drainage at Eielson AFB is generally north-northwest parallel to the Tanana River.

Several small sloughs or creeks pass through the Base and discharge to the Tanana River. Moose Creek is the main receiving stream for small local drainages around the Base. Both French Creek, along the eastern edge of the Base, and Piledriver Slough, along the western side, discharge to Moose Creek just above its confluence with the Tanana River.

Garrison Slough, which is a surface drainage, also discharges to Moose Creek. Garrison Slough passes directly through the developed portion of the Base and consists primarily of engineered drainage channels. Portions of Garrison Slough are enclosed in culverts near the refueling loop area. Prior to 1979, effluent from the Base sewage treatment plant was discharged to Garrison Slough.

Eielson AFB contains 13 lakes totaling 313 acres, 54 ponds totaling 265 acres, and ten designated wetlands totaling about 252 acres. One of the lakes and six of the ponds are natural; the remaining 12 lakes and 48 ponds are old borrow pits or gravel pits.

1.1.4 Surface Water and Groundwater Interactions

Surface water features such as lakes, ponds, or sloughs affect local groundwater flow patterns, especially in the shallow portions of the aquifer (i.e., depths of 0 to 15 feet). Surface water bodies can act as sources of recharge to the aquifer or as outlets for discharge, depending on the specific channel reach and seasonal changes in surface flow and water availability.

Little is known about the interaction between the groundwater system and local ponds, lakes, and wetlands because of the lack of synchronous groundwater and surface-water elevation measurements. Generally, in the eastern portion of the Eielson AFB, French Creek is an influent stream that loses water to the subsurface groundwater system, and in the western portion of the Base, French Creek is an effluent stream that gains water from the subsurface. Moose Creek is an influent stream in the northeast portion of the Base and effluent stream in the western portion. Garrison Slough is an effluent stream throughout the Base.

2.0 OPERABLE UNIT REMEDIAL ACTION

The following sections describe the selected remedies and current status of the Eielson AFB OUs. All RODs have been signed and response actions are in progress. The RODs and RAS Reports (USAF 1998a, b, c, d, e) contain the details and the status of the remedial action(s) including a discussion of the applicable or relevant and appropriate requirements (ARARs) for each OU. Re-evaluation of the ARARs is not required at sites where response actions are ongoing. However, the reviewers did evaluate whether any cleanup standards or requirements for site-related contaminants of concern had been changed which would call into the question the protectiveness of the remedies for Eielson AFB, and no such changes were found, thus providing further assurance that the selected remedies remain protective.

The primary objective of Remedial Actions at Eielson AFB OUs is to restore groundwater to its beneficial use. During the cleanup, ICs eliminate the threat of exposure to contaminated media and groundwater monitoring provides information about remedial progress. Because groundwater monitoring and ICs are required at each OU, a Basewide approach for implementing these remedies has been established and is described below.

2.0.1 Sitewide Groundwater Monitoring

The Sitewide Monitoring Program (SWMP) for Eielson AFB provides a mechanism for continued cohesive monitoring throughout the Base. The scope of the SWMP varies from year to year as wells are added or removed from the program. The results of sitewide groundwater monitoring are reported in the SWMP annual reports. Currently, sitewide monitoring is conducted by EA Engineering, Science, and Technology, Inc. (EA), under contract with the U.S. Air Force.

The SWMP was initiated in 1992 with the collection of groundwater samples from background wells (located hydraulically upgradient of the Base) and from the north boundary wells (located downgradient of the developed portion of the Base). In 1993 and 1994, the program was expanded to include selected wells from OU source areas and SER sites and some surface water and sediment sample locations.

Natural attenuation is monitored as a component of several remedies selected for Eielson AFB. Data currently suggest that natural attenuation is occurring at rates expected to achieve cleanup goals within the time frames predicted in each ROD.

The SWMP and the OU selected remedies are currently, and are expected to remain, protective of human health and the environment. Groundwater from a sitewide perspective will be addressed in future periodic reviews and, if necessary, further actions will be evaluated.

2.02 Institutional Controls

ICs have been implemented to comply with selected remedies listed in the RODs for OUs 1 through 6 and the Sitewide Unit. The purpose of these ICs is to prevent exposure to contaminated media. Specific controls include land use restrictions and prohibitions on the use of groundwater. ICs will be incorporated into the Base General Plan (USAF 1998f). The Eielson AFB Environmental Compliance Section is responsible for overseeing compliance with these ICs. Implementation and effectiveness of these ICs is reviewed at least annually by Environmental Flight (3 CES/CEV) and any proposed changes affecting these controls are forwarded to EPA and ADEC for review.

The following procedures have been adopted to ensure compliance with ICs.

- **New or Proposed Facilities.** For proposed facility siting and/or new construction, the ICs are enforced through Base Development (3 CES/CECD) and the Environmental Planning element (3 CES/CEVP). 3 CES/CECD has incorporated the ICs into the Base General Plan. When there is a proposed project on Base, 3 CES/CECD reviews the Base General Plan to determine if the project is in an area affected by ICs. If the project is within an area where ICs are in place, then the project is forwarded to the Environmental Planning element for review. Environmental Planning, in consultation with Environmental Restoration (3 CES/CEVR), reviews the project to determine if the project complies with specific ICs. If the project conflicts with the ICs, then the project is disapproved.

- **Work Order (AF Form 332) and Base Civil Engineer's (BCE) Work Clearance Request.** All AF Form 332s and BCE Work Clearance Requests (3rd Wing Form 3) are routed through the Environmental Flight (3 CES/CEV) for review. Environmental Planning reviews AF Form 332s to ensure compliance with all environmental requirements, including ICs. If an activity is proposed in an area affected by ICs, then Environmental Restoration is consulted to determine if the activity complies with specific ICs. If the activity conflicts with the ICs, then the activity is disapproved. All BCE Work Clearance Requests are routed through Environmental Restoration for review because these requests normally involve some type of excavation. Environmental Restoration reviews each request and conducts site visits as appropriate to ensure ICs and other restrictions are enforced.

- **Real Estate Transactions.** The Real Estate office (3 CES/CERR) is responsible for ensuring ICs are incorporated into all real estate instruments such as easements, licenses, right-of-entry, and permits. Tenants, permittees, etc. are required to provide an annual certification of compliance

with ICs. For new real estate transactions and renewals of real estate instruments, Air Force regulations require the Environmental Flight to perform an Environmental Baseline Survey (EBS). Land use and other restrictions are incorporated into the EBS and the real estate instrument to ensure ICs are enforced.

2.1 Operable Unit 1 (OU1)

OU1 consists of eight source areas where fuel contaminants have been released to the soil and groundwater (Figure 2). Free-phase fuel (free product) or non-aqueous-phase liquid (NAPL) has been detected in past sampling efforts at each of the following source areas:

- ST20 E-7, E-8, and E-9 Complexes (Fueling Loop)
- ST48 Powerplant Area
- ST49 Alert Hanger
- SS50 Blair Lakes Vehicle Maintenance
- SS51 Blair Lakes Ditch
- SS52 Blair Lakes Diesel Spill
- SS53 Blair Lakes Fuel Spill

Three of these source areas (ST20, ST48, and ST49) are located in the industrial portion of the Base. The remaining source areas are located at the Blair Lakes Facility, a remote target range support facility approximately 25 miles west of the main runway of Eielson AFB.

An Interim Record of Decision (ROD) was signed in September 1992 to address floating product found at Source Areas ST20, ST48, ST49, and SS50 through SS53 (USAF 1992). As a result of the Interim ROD, bioventing systems were installed at ST20 (E-7), ST20 (E-9), and ST48. The bioventing systems at ST20 (E-7) and ST48 were installed in 1991 and 1992 to test the feasibility of using these systems to remediate fuel contamination in a subarctic environment. Favorable test results led to selection of bioventing as the preferred remedial action for the fuel-contaminated sites as documented in the OU1 ROD.

The OU1 ROD was signed in September 1994 (USAF 1994a) and focused on continued product recovery and soil remediation through bioventing and soil vapor extraction (SVE). Three of the source areas (ST49, SS53, and DP54) were designated in the OU1 ROD as no further action sites because they present little risk to human health and the environment. The selected remedy for ST20, ST48, and SS50, 51, and 52 included the following components:

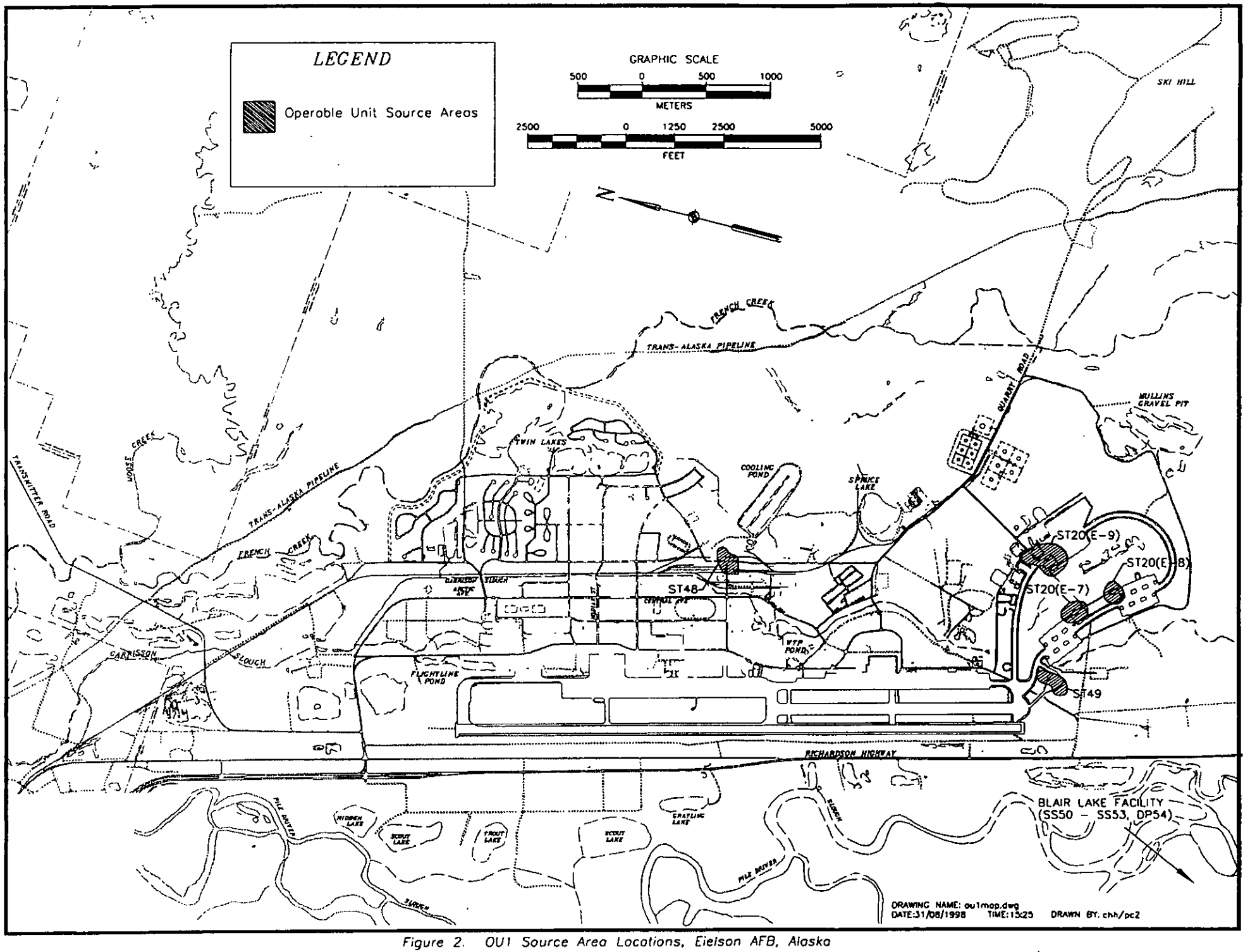

Figure 2. OU1 Source Area Locations, Eielson AFB, Alaska

- Expand the bioventing and SVE systems operating under the OU1B Interim ROD to remediate soil contamination that poses a threat to groundwater through leaching.

- Install a bioventing/SVE system to remediate soil contamination that poses a threat to groundwater through leaching at ST20 (E-8 Complex) and at SS50, 51, and 52. Perform supplemental soil and groundwater sampling to confirm that no significant contamination remains. The effect of a bioventing system on the permafrost at Blair Lakes (SS50 through SS53) will be evaluated prior to implementation.

- Install passive skimming systems to remove fuel floating atop the groundwater if product is sufficiently mobile to be recoverable. Continue to operate the free product skimming system operating under the interim remedial action (OU1B) at SS51 to remediate soil contamination that poses a threat to groundwater.

- Monitor groundwater, including increased monitoring near Base water supply wells, to evaluate contaminant fate and transport until remediation levels are achieved; and

- Prevent exposures to contaminated soil and groundwater through ICs. In the event of Base closure, any remaining contaminated areas will be addressed in accordance with CERCLA Section 120.

In addition, the USAF agreed to remove two underground storage tanks from ST48 under the ADEC Underground Storage Tank Program. These tanks were removed in May 1995 (Janssen and Shaw 1995).

2.1.1 Current Status

Remedial actions at OU1 are operational and functional, as documented in the OU1 RAS Report (USAF 1998a). Based on site visits and reviews/evaluation of current monitoring data and trends, the bioventing systems at ST20 (E-7 and E-9) and ST48, and the product recovery systems at SS50, 51, and 52 are operating within design parameters and progress is being made toward remediation.

Improvements were made to the ST20 (E-7) and ST48 bioventing systems during the 1997 field season to expedite achievement of remedial action goals while minimizing interference with Base operations. Bioventing systems were not implemented at ST20 (E-8) or at SS50, 51, and 52. Existing site data from ST20 (E-8) indicate that only a small portion of the aquifer at the site contains benzene at levels greater than 100 µg/L. Oxygen levels were measured at greater than 10 percent in vadose zone soil-gas samples collected throughout most of the site. For these reasons, bioventing does not appear to be warranted at the present time. Bioventing was specified for SS50, 51, and 52 dependent on its applicability to the sites. The results of data gap work conducted at SS50, 51, and 52 indicated that bioventing would likely interfere with free product recovery efforts. Recoverable amounts of floating product are no longer present at source areas ST20, ST48 and ST49, and are declining at SS50, 51, and 52. Operation and maintenance of the OU1 remedial systems are continuing in accordance with the OU1 Remedial Action Workplan (USAF 1995e) and OU1 Remedial Action Workplan Addendum (USAF 1998g).

An evaluation of groundwater sampling conducted under the SWMP indicate that contaminant concentrations have declined and/or contaminant plumes have stabilized at all OU1 source areas (USAF 1998a, h). The reduction of contaminants in groundwater (and by inference in soil) is occurring at rates consistent with projected remediation times as evidenced by groundwater monitoring and respiration test results. Groundwater monitoring under the SWMP will continue until remediation goals are met.

Long-term operation (LTO) and maintenance of the remedies for OU1 will remain in effect until groundwater cleanup goals are achieved. ICs have been implemented where applicable and are maintained to prevent exposure to contamination. The OU1 remedies remain protective of human health and the environment and are functioning as designed. OU1 remedies will be addressed in future periodic reviews and, if necessary, further actions will be evaluated.

2.2 Operable Unit 2 (OU2)

OU2 consists of seven source areas where fuel contaminants have been released to the soil and groundwater (Figure 3). Free product, or NAPL, has been detected at some of the source areas. OU2 source areas include:

- ST10 E-2 Complex, Petroleum, Oil, and Lubricant (POL) Storage
- ST11 Fuel Saturated Area
- ST13 E-4 Complex, Diesel Fuel Spill
- SS14 E-2 Complex, JP-4 Fuel Spill Area
- ST18 Oil Boiler Fuel Saturated Area
- ST19 JP-4 Fuel Line Spill
- DP26 E-10 Complex, Fuel Tank Sludge Burial Site

Four sites (ST10, SS14, ST13, and DP26) were selected for active remediation. ST10 includes the E-2 POL storage area on Quarry Road and Hardfill Lake. The storage area includes six aboveground fuel tanks. SS14 is located immediately southwest of ST10. Until 1977, this area was used for rail delivery of fuel to the storage area. Source areas ST13 and DP26 are located near the southeast end of the main taxiway. ST13 is located west of Flightline Avenue, and contains a fuel pump house, Building 1240, ten underground fuel storage tanks, and five fuel outlets. DP26 is located directly across Flightline Avenue from ST13 and includes an aboveground storage tank, ancillary piping and former truck fuel stands. Because of their close proximity and similarity of contaminants, source areas ST10 and SS14 are considered together as are source areas ST13 and DP26.

Three source areas (ST11, ST18, and ST19) will receive no further remedial action because they do not pose an unacceptable risk to human health or the environment; however, groundwater at these sites will continue to be monitored as part of the SWMP. ICs are in effect at these sites to prevent exposure to contaminated groundwater and soil. Although no action was required for ST18 under CERCLA, the USAF agreed to remove two underground storage tanks under the ADEC Underground Storage Tank

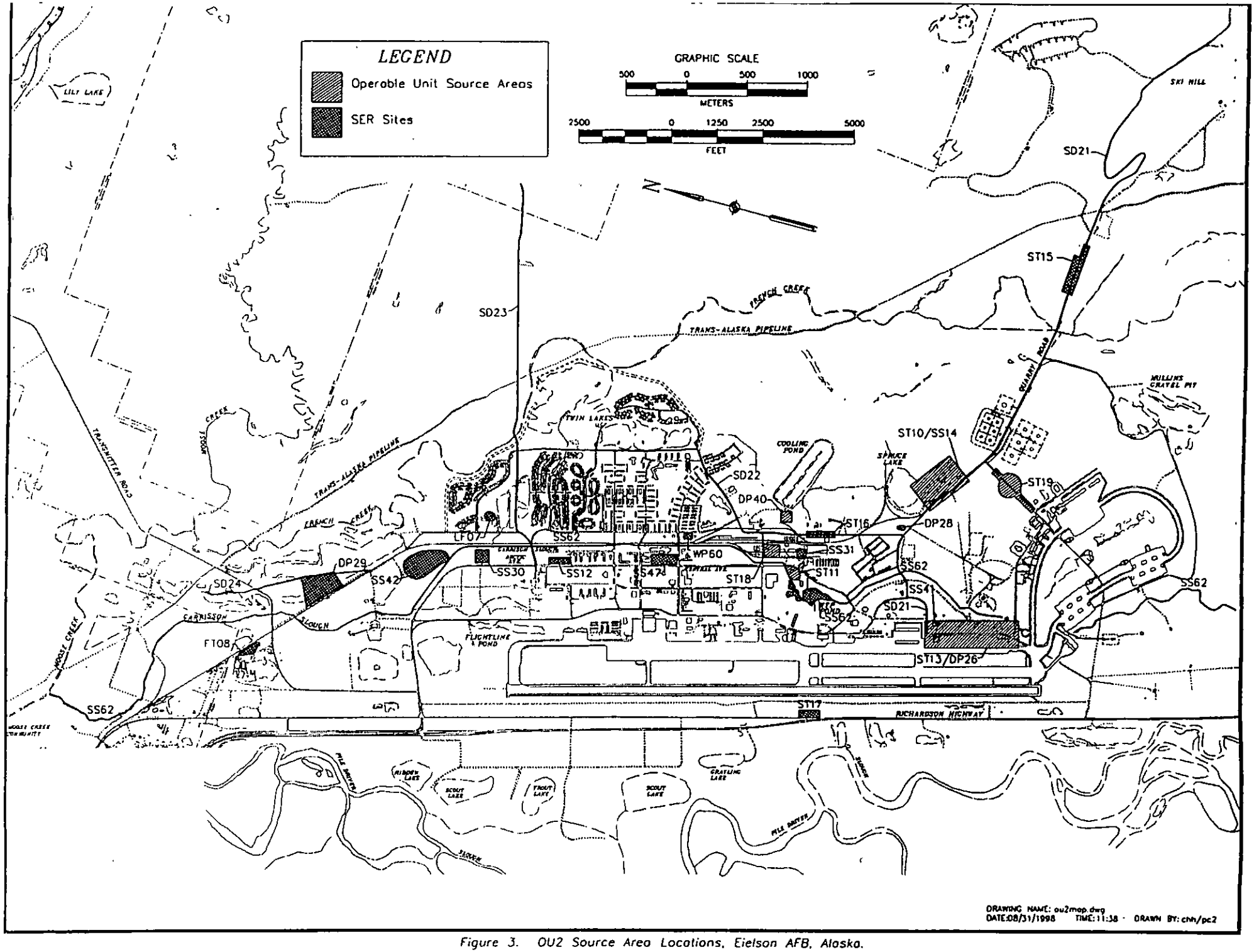

Figure 3. OU2 Source Area Locations, Eielson AFB, Alaska.

Program. These tanks were removed in 1994 (Brown & Root 1994). In addition, one drywell and one cesspool were removed from ST18 in 1996 (USAF 1997a).

By joint agreement between the USAF, EPA, and ADEC, two RCRA-related areas were addressed in conjunction with Source Area ST10. These areas included a former drum storage area and an area used to store sandblasting grit. An evaluation completed in July 1996 by Jacobs Engineering Group, Inc. (JE) indicated that contaminant levels specified in the OU2 ROD were not exceeded in soil samples collected at these sites (USAF 1996a). Therefore, no further remedial action is proposed for the RCRA sites at ST10. In addition, a RCRA-related area containing approximately 265 improperly stored and labeled drums was addressed in conjunction with Source Area ST16. The drums were removed and properly disposed of through the Air Force Hazardous Materials Program. A site inspection in August 1993 revealed small amounts of tar or asphalt deposits and several small paint spills, but no indication of spilled solvents. No further action is proposed for these sites.

Twenty-one areas previously identified as potential sources of contamination were included in the OU2 ROD as "Other Areas". These sites will receive no further action because, based on existing information, they do not present an unacceptable risk to human health and the environment. However, areas LF05 and SS31 are monitored under the SWMP to verify that contaminant concentrations, if any, remain within acceptable screening levels. The source areas that will receive no further action include:

- LF05 Old Army Landfill
- LF07 Test landfill
- FT08 Fire Training Area, Past
- SS12 JP-4 Fuel Spill, Building 2351
- ST15 Multiproduct Fuel Line
- ST16 MOGAS Fuel Line Spill
- ST17 Canol Pipeline Spill
- SD21 Road Oiling, Quarry Road
- SD22 Road Oiling, Industrial Road
- SD23 Road Oiling, Manchu Road
- SD24 Road Oiling, Gravel Haul Road
- DP28 Fly Ash Disposal Site
- DP29 Drum Burial Site
- SS30 Polychlorinated Biphenyls (PCB) Storage Area
- SS31 PCB Storage Facility
- DP40 Power Plant Sludge Pit
- SS41 Former Auto Hobby Shop
- SS42 Miscellaneous Storage and Disposal Area
- SS47 Commissary Parking Lot Fuel Spill
- WP60 New Auto Hobby Shop
- SS62 Garrison Slough

The selected remedies for Source Areas ST10/SS14 and ST13/DP26 identified in the 1994 OU2 ROD (USAF 1994b) include the following components:

- Install bioventing systems at ST13/DP26 and ST10/ST14 to remediate soil contamination that poses a threat to groundwater through leaching.

- Remove free product floating atop the groundwater where the product is sufficiently mobile to be recoverable. Install an active skimming system at ST13/DP26 and a passive skimming system at ST10/SS14.

- Install groundwater extraction and treatment facilities in areas of highest groundwater lead concentrations at ST13/DP26. Monitor the distal end of the groundwater contaminant plume to evaluate if the plume is expanding. Monitoring will continue for five years, at which time the need for further monitoring will be evaluated. If the plume is expanding, hydraulically contain the groundwater plume by extracting groundwater from near the plume's distal end. Groundwater extracted from the hydraulic containment well will be treated in the physical/chemical system (the Base water treatment facility).

A field investigation to evaluate the feasibility of utilizing pump and treat technology for remediation of lead contamination at ST13/DP26 was conducted by International Technology Corporation (IT) (USAF 1996b) during the 1995 summer season. This study indicated that the lead is apparently immobile and that remediation of the aquifer for lead contamination by pump and treat technology would require decades. Based on the conclusions of this study, the selected remedy to extract and treat groundwater at ST13 and DP26 changed to a Technical Impracticability Waiver for groundwater lead contamination with institutional controls and monitoring in a 1998 amendment to the OU2 ROD (USAF 1998i).

An Interim Treatment Report (USAF 1997b) indicated that weathered floating product at the OU2 source areas is not sufficiently mobile to justify the use of active floating product removal. Active floating product removal would involve the use of a dual-phased skimmer pump to provide a hydraulic gradient. Therefore, the amended OU2 ROD included a modification that substitutes the use of passive skimming systems in areas where product is sufficiently mobile to be recoverable.

2.2.1 Current Status

Remedial actions at OU2 are operational and functional as documented in the OU2 Remedial Action Summary report (USAF 1998b). In November 1995, AGRA Earth and Environmental, Inc. submitted a Remedial Action Workplan and Remedial Action Design for OU2 (USAF 1995f). Construction of two bioventing systems at ST13/DP26 and two bioventing systems at ST10/SS14 were completed in November 1995. Product recovery efforts are continuing at wells with sufficient recoverable product. As of February 11, 1998 approximately 380 gallons of floating product have been recovered at OU2. The wells and skimmer systems are equipped with heat trace to keep the wells thawed and allow for product recovery during the winter months. Operation and maintenance of the remedial systems were turned over to EA in 1998 and are performed in accordance with procedures described in the OU2 Operations and Maintenance Manual (USAF 1997d).

Based on site visits and reviews of site data, the bioventing systems and the passive product recovery systems at ST10/SS14 and ST13/DP26 are operating within design parameters and progress is being made toward remediation. Floating product is currently being collected at both sites. Respiration tests indicate that operation of the bioventing systems is resulting in the degradation of petroleum contaminants at OU2

(USAF 1998j). Groundwater contaminant concentrations have declined or the contaminated plume has stabilized at all OU2 source areas (USAF 1998b, h). The reduction of contaminants in groundwater (and by inference in soil) is occurring at rates consistent with projected remediation times as evidenced by groundwater monitoring and respiration test results. Groundwater monitoring under the SWMP will continue until remediation goals are met.

LTO and maintenance of the remedies for OU2 will remain in effect until groundwater cleanup goals are achieved. ICs have been implemented where applicable and are maintained to prevent exposure to contamination. The OU2 remedies remain protective of human health and the environment and are functioning as designed. OU2 remedies will be addressed in future periodic reviews and, if necessary, further actions will be evaluated.

2.3 Operable Units 3, 4, and 5 (OU3,4,5)

OU3,4,5 includes 20 source areas that have been combined because of commonalties in contamination (Figure 4). These source areas consist of solvent and fuel spill sites, fuel storage tank areas, drum storage areas, asphalt-cement mixing areas, landfills, and a fire training area. The OU3,4,5 source areas are listed below.

- DP44 Battery Shop Leachfield
- WP45/SS57 Photo Lab/Fire Station Parking Lot
- ST56 Engineer Hill Spill Site
- SS61 Vehicle Maintenance Building 3213
- DP25 E-6 Fuel Storage Tank Area
- ST27 E-11 Fuel Storage Tank Area
- WP33 Wastewater Plant Effluent Infiltration Pond
- SS35 Asphalt Mixing and Drum Burial Area
- SS36 Drum Storage Area
- SS37 Drum Storage Area
- SS39/SS63 Asphalt Lake/Asphalt Lake Spill Site
- ST58 Old Quartermaster Service Station Site
- SS64 Transportation Maintenance Drum Storage Site
- LF02 Old Base Landfill
- LF03/FT09 Inactive Base Landfill/Fire Training Area
- LF04 Old Army Landfill and Explosive Ordnance Disposal Area
- LF06 Old Landfill

Four source areas (DP44, SS35, ST58, and LF03/FT09) were designated by the OU3,4,5 ROD to receive active remediation. DP44 includes an area containing a battery shop (Building 1141), an avionics and electronics repair building (Building 1138), and various flightline storage and maintenance buildings. There are two closed drywells and one active drywell at this site. The active drywell was connected to all floor and roof drains in Building 1140 until 1995 when the floor drains were diverted to the sanitary sewer (USAF 1995a). SS35 is a former asphalt mixing and drum burial area near the Base water treatment plant. ST58 is the site of the old Quartermaster Service Station at the intersection of Division Street and Wabash Avenue. Prior to 1988, fuel was stored in four aboveground storage tanks at this facility. In 1993, 500 to 600 cubic yards (cy) of contaminated soil associated with these tanks was removed

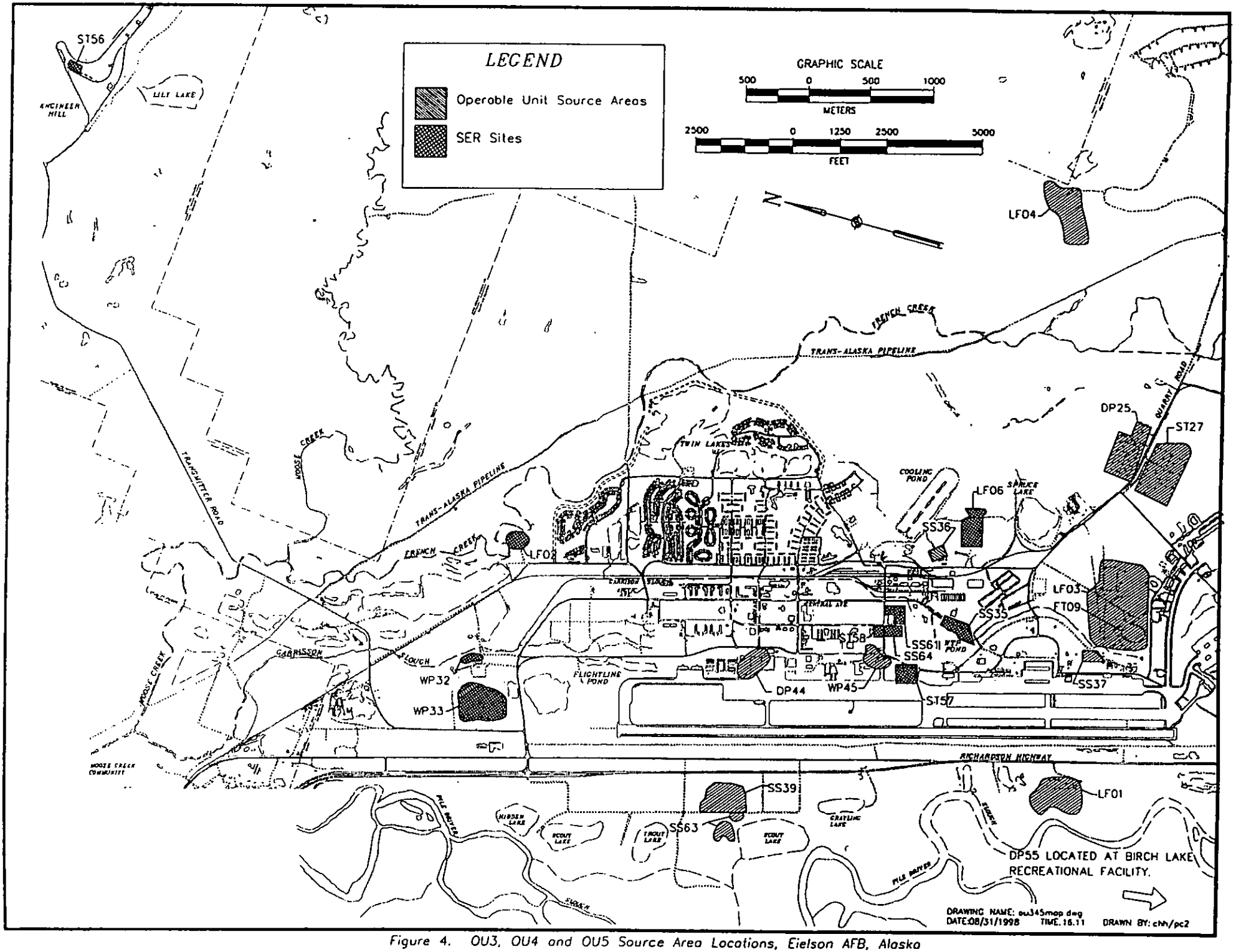

Figure 4. OU3, OU4 and OU5 Source Area Locations, Eielson AFB, Alaska

from the site (Battelle 1995) and remediated as part of an on-Base composting demonstration (USAF 1994c). LF03 was the main Base landfill from 1967 to 1987. LF03 covers approximately 90 acres of land east of the south end of the runway and north of the refueling loop. The surface of the landfill is used for storage of contaminated materials, debris, and landfarming. FT09, a former fire training area, is located within the west-central part of LF03.

Source Areas WP45/SS57, ST56, SS61, and DP25 were selected for limited action, including groundwater monitoring and ICs. WP45/SS57 is a former photography shop and fire station where fire training exercises were conducted. A drywell at this site was closed in 1993 (USAF 1995a). ST56 is a munitions storage and maintenance facility located approximately 3 miles north-northeast of the Base. The septic tank and leachfield that service this area were disconnected and replaced with a new system in 1995 (USAF 1996c). SS61 includes the vehicle maintenance shop where wastewater was discharged to two dry wells until 1992. The drywells and surrounding contaminated soil was removed in 1993 (USAF 1995a). Source Area DP25 includes the E-6 fuel storage tank area located north of Quarry Road. This area contains nine aboveground tanks that were used for JP-4 jet fuel storage until 1992 when they were converted to JP-8 fuel storage tanks. The E-6 storage area is currently being upgraded under the Base Tank Program to prevent or contain spills within the tank complex. The remaining ten source areas in OU3,4,5 will receive no further action because, based on existing information, they do not present an unacceptable risk to human health and the environment.

The OU3,4,5 ROD, signed in September 1995 (USAF 1995b), included active remediation as the preferred alternative for sites DP44, SS35, ST58, and LF03/FT09. The selected remedy for these sites included the following components:

- Installation of soil vapor extraction (SVE) systems at DP44 and ST58 to remove solvent contamination in soil that is posing a threat to groundwater through leaching. The system at ST58 may include either air injection within the upper part of the groundwater table and smear zone to volatilize and promote bioremediation of the contaminants, or air extraction, if deemed appropriate.

- Installation of a soil cover over surface soil contamination at SS35 to prevent direct contact by humans and animals and surface water runoff into Garrison Slough; removal of drums in the future, if it is determined that they are a continuing source of contamination.

- For the portion of the landfill where disposal occurred before 1980, RCRA Part 264 is relevant and appropriate. As of 1995, no groundwater at the edge of the waste management area exceeds regulatory levels. However, 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 RCRA Part 264. Groundwater at the landfill will continue to be monitored, as appropriate, to verify that the contaminant concentrations 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).

- ICs to prevent exposure to contaminated groundwater. ICs will be implemented to restrict land use at LF03/FT09. In the event of Base closure, any remaining contaminated sites will be addressed in accordance with CERCLA Section 120.

- Monitor the groundwater to evaluate contaminant levels and to identify changes to contaminant plume configuration until remediation levels are achieved. Monitoring at SS35 includes surface water, sediment, and aquatic organisms in this area, as needed to verify effectiveness of the cover.

The OU3,4,5 ROD was amended in August 1998 (USAF 1998k) to address additional data available after the initial ROD was signed in 1995. Scoping and data gap work in support of the OU3,4,5 Remedial Design began in September 1995 (1997c). Other relevant work included studies by Utah Water Research Laboratory on natural attenuation of petroleum hydrocarbons and chlorinated hydrocarbons (UWRL 1995c) and studies of lead migration and treatability by International Technology Corporation (USAF 1996b). Scoping of the OU3,4,5 remediation resulted in some fundamental changes to the selected remedies chosen for the remedial action sites DP44, SS35, ST58, and LF03/FT09. These changes are documented and explained in the OU3,4,5 Remedial Design and the OU3,4,5 ROD Amendment. The modification to the 1994 ROD includes the following components:

- Based on the results of a pilot study conducted in RD, residual soil contamination is not expected to act as a continuing source of groundwater contamination at DP44 and ST58. No further action for soil remediation is proposed for these source areas.

- Based on a re-evaluation of site conditions fromnew information gathered after the ROD was signed, additional soil cover is not necessary for protection of human health or the environment. No further action is warranted under the Superfund program at SS35.

- A cover at LF03/FT09 to address the direct contact threat will be maintained in accordance with relevant and appropriate requirements of RCRA Part 264.

- Continued monitoring to confirm that groundwater contamination is not migrating. At ST58, regulatory requirements for lead contamination in groundwater would be waived within the established containment area. Continued monitoring at SS35 of surface water, sediment, and aquatic organisms in Garrison Slough to confirm that concentrations remain at levels that are protective of human health and the environment.

- Implementation of ICs to prevent use of the contaminated groundwater in the source areas at DP44 and ST58 and to restrict land use at LF03/FT09.

The selected remedy for limited action sites at OU3,4,5 included the following components:

- ICs to prevent exposure to contaminated groundwater. In the event of Base closure, any remaining contamination will be addressed in accordance with CERCLA Section 120.

- Groundwater monitoring to evaluate contaminant levels and identify changes to contaminant plume configuration until remediation levels are achieved.

- For groundwater at ST56, wellhead treatment using carbon adsorption or air stripping will be applied, as appropriate, to prevent human exposure to contaminants above regulatory levels.

- If future developments in bioventing technology make implementation practical under the tanks at DP25, installation of a bioventing system will be re-evaluated at that time.

2.3.1 Current Status

Remedial actions at OU3,4,5 are operational and functional as documented in the OU3,4,5 Remedial Action Summary report (USAF 1998c). In November 1995, EA submitted a Remedial Action Workplan and Remedial Design for OU3,4,5 (USAF 1997b, c). The Remedial Design addresses remediation at the four sites designated to receive active remediation in the ROD (DP44, ST58, SS35, and LF03/FT09) and two of the four sites receiving limited action (ST56 and DP25). Based on the new information identified in the RD stage, the remedies were amended for DP44, ST58, and SS35. Limited action at the remaining sites (WP45/SS57 and SS61) was initially addressed in the 1995 SWMP Workplan (USAF 1995g).

Implementation of the 1998 Amended ROD changed the selected remedy at DP44, SS35, and ST58 to no further action for SS35 and limited action for ST58 and DP44 including monitoring and ICs. At DP44 and ST58, groundwater contaminant concentrations have declined and/or the contaminant plumes have stabilized (USAF 1998c, h). At SS35, contaminant levels in the water, soil, and aquatic organisms are considered to be protective of human health and the environment. At LF03/FT09, the Air Force made improvements to the cover and constructed gates to restrict access to the landfill in 1996 (USAF 1997e). Based on site visits and reviews of site data, the soil cover at LF03/FT09 is functioning within design parameters. Contaminants, above regulatory levels, have not been detected in groundwater samples collected from monitoring wells on the periphery of LF03. Post closure care of LF03, including maintenance and monitoring, will be conducted by the Air Force institutional controls in accordance with 40 CFR 264.117 and 264.228(b).

At the limited action source areas, groundwater contaminant concentrations have declined and/or the contaminant plumes have stabilized (USAF 1998c, h). Bioventing and/or excavation was evaluated for DP25 during data gap work but are not proposed at this time because of difficulties with implementation and probable limited effectiveness caused by a shallow groundwater table and presence of tanks, piping, and proposed liners. Potable water is now supplied to the Engineer Hill facility at ST56. Data gap work in 1996 indicated that contamination above the maximum contaminant level (MCL) remained in the tap water at this facility but was below the MCL at the point of

compliance where the facility wastewater is discharged. Based on these results, no treatment of the water at ST56 is planned under the OU3,4,5 Remedial Design.

Results of groundwater sampling and environmental monitoring conducted under the SWMP (USAF 1998h) indicate that contaminant concentrations at all OU3,4,5 source areas are either at acceptable levels or that the groundwater plumes have stabilized. The reduction of contaminants in groundwater (and by inference in soil) is occurring at rates consistent with projected remediation times as evidenced by groundwater monitoring. Groundwater and environmental monitoring under the SWMP and institutional controls will continue until remediation goals are met.

LTO and maintenance of the remedies for OU3,4,5 will remain in effect until groundwater cleanup goals are achieved. ICs have been implemented where applicable and are maintained to prevent exposure to contamination. The OU3,4,5 remedies remain protective of human health and the environment and are functioning as designed. OU3,4,5 remedies will be addressed in future periodic reviews and, if necessary, further actions will be evaluated.

2.4 Operable Unit 6 (OU6)

OU6 consists of a single source area, WP38, located in the southeastern area of the Base (Figure 5). WP38 includes approximately 200 acres of southwest-facing hillside near the Eielson AFB Ski Lodge. Eight 50,000-gallon aboveground tanks and a number of smaller tanks were located on the crest of the ridge, along the southwest side of "B" Battery Road. The tanks were used to store aviation and/or diesel fuel. Use of the tanks was discontinued in 1972, and the tanks, their associated piping, and their concrete sub-bases were removed in 1977.

The OU6 ROD was signed on September 27, 1994 (USAF 1994d). The selected remedy at WP38 included groundwater monitoring and ICs to limit or prohibit activities that may result in exposure to hazardous substances in the groundwater at the site.

2.4.1 Current Status

Remedial actions at OU6 are operational and functional as documented in the OU6 Remedial Action Summary report (USAF 1998d). Remedial actions at OU6 were limited to groundwater monitoring and ICs. Collecting groundwater samples from the wells at WP38 is logistically difficult because the wells in the bedrock of the ski hill are very deep (greater than 150 feet). The wells in the alluvial aquifer are installed in discontinuous permafrost, which causes the water in the well casings to freeze. Heat tape was installed in one of the wells, which is completed in permafrost and prone to freezing. Before samples are collected, the heat tape is energized and the groundwater in the casing is thawed.

Results of groundwater sampling conducted under the SWMP (USAF 1998h) indicate that the contaminant plume has stabilizing at WP38. The reduction of contaminants in groundwater (and by inference in soil) is occurring at rates consistent with projected remediation times as evidenced by groundwater monitoring and respiration test results. Groundwater monitoring under the SWMP will continue until remediation goals are met.

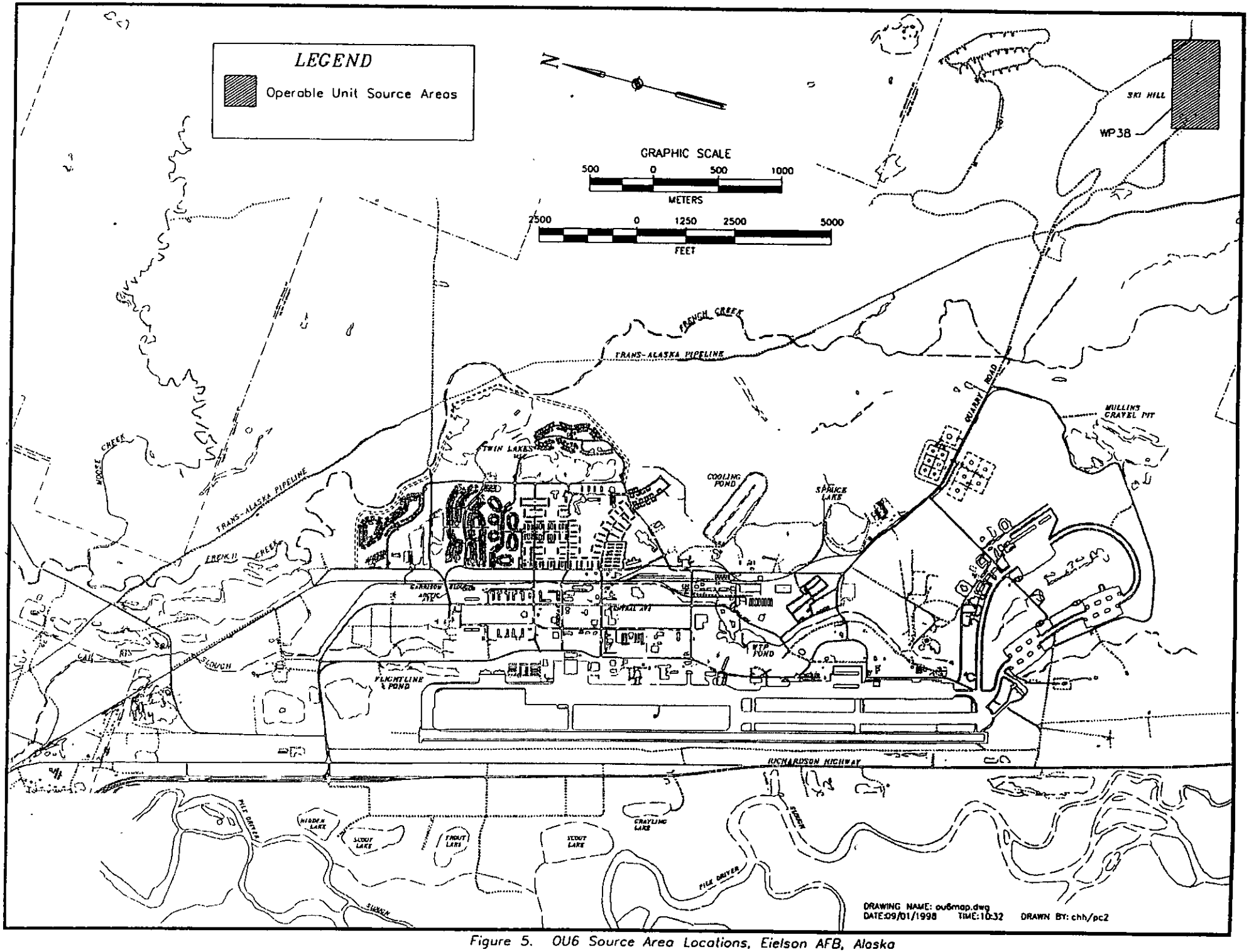

Figure 5. OU6 Source Area Locations, Eielson AFB, Alaska

LTO and maintenance of the remedies for OU6 will remain in effect until groundwater cleanup goals are achieved. Institutional controls have been implemented and are maintained to prevent exposure to contamination. The OU6 remedies remain protective of human health and the environment and are functioning as designed. OU6 remedies will be addressed in future periodic reviews and, if necessary, further actions will be evaluated.

2.5 Sitewide Unit.

The Sitewide Remedial Investigation at Eielson AFB (USAF 1995d) evaluated Basewide contamination that is not confined or attributable to specific source areas identified and addressed in the FFA as well as cumulative risks to human health and the environment posed by contamination on a sitewide basis. No previously unidentified groundwater contamination was found in the sitewide investigation. The following surface waters were evaluated to determine whether they were affected by contamination from one or more source areas: Garrison Slough, French Creek, Moose Creek, Piledriver Slough, Flightline Pond, and Lily Lake. Of these surface water bodies, Garrison Slough, Source Area SS67, is the only one that was found to pose an unacceptable risk to human health and the environment (Figure 6). Polychlorinated biphenyl (PCB) was found in fish tissue and sediment within Garrison Slough. PCB contamination detected in the soil of a shallow channel draining into Garrison Slough is the suspected source of contamination of slough sediment via surface water runoff.

The Sitewide ROD was signed in September 1996 (USAF 1996d). The major components of the selected remedy at SS67 include the following:

- ICs to control fishing in Garrison Slough;
- Installation of fish screens to prevent the migration of fish into and out of the PCB-impacted section of Garrison Slough.
- Excavation of contaminated soil and sediment with concentrations greater than 10 mg/kg PCB;
- Onsite (LF03) disposal of material with PCB concentrations less than 50 mg/kg;
- Offsite disposal or treatment of materials with PCB concentrations equal to or greater than 50 mg/kg in accordance with TSCA, 40 CFR part 761; and
- Environmental monitoring of soil, sediment, surface water, fish, and groundwater.

2.5.1 Current Status

Remedial actions at SS67 are operational and functional as documented in the Sitewide Remedial Action Summary report (USAF 1998e). In 1996, EA submitted a Pilot Test Workplan addressing selected remedies at Garrison Slough (USAF 1996e) and implemented the workplan in 1996 and 1997. Additional remedial work was completed by Arctic Slope Regional Corporation Contracting Company, Inc. (ACCI) during the 1997 and 1998 field seasons under a workplan submitted in July 1997

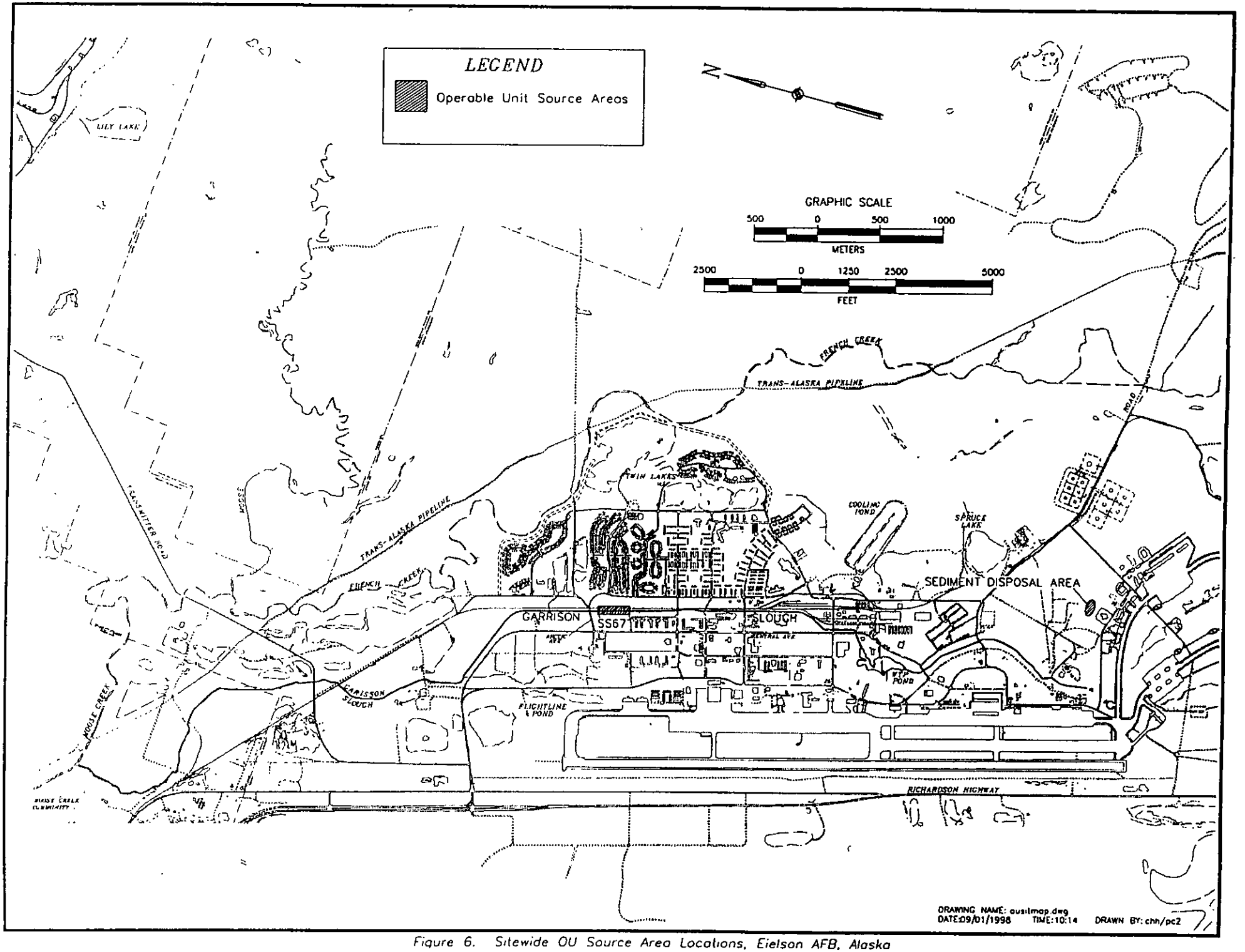

Figure 6. Sitewide OU Source Area Locations, Eielson AFB, Alaska

(USAF 1997f). Approximately 460 cy of soil was excavated from the drainage trench identified as the source of PCB contamination in Garrison Slough. In addition to the soil, approximately 620 cy of sediment was vacuumed and/or dredged from a 625-foot section of the slough immediately downstream of the drainage trench (USAF 1997g, USAF 1998l). Soil or sediment containing 10 to 50 ppm PCB was placed into two below-grade containment cells at LF03. Soil or sediment containing 50 ppm and greater PCB was turned over to the Defense Reutilization Management Office for further treatment in accordance with TSCA, 40 CFR Part 761.

Wire mesh fish barriers (fish screens) were constructed in August 1996 by EA to prevent fish migration into and from the PCB-impacted section of Garrison Slough. These barriers were erected on dual drainage culverts which underlie a gravel road near the north Base boundary. The barriers are currently in place and will be maintained until PCB concentrations in fish tissue samples are reduced to acceptable levels.

Exposures to contaminated fish at SS67 are prevented through ICs. These controls prevent human exposure to contaminants at concentrations above federal and state standards by restricting activities at the site. Garrison Slough is designated as a restricted use area in the Eielson AFB Management Action Plan. A verbal warning is given to persons receiving a fishing permit for Eielson AFB. The warning states that PCB contamination has been found in Garrison Slough and a cancer risk exists if fish taken from slough are eaten. In addition, the Alaska Department of Fish and Game has designated Garrison Slough a catch-and-release-only area. This classification further reduces the potential for ingestion of contaminated fish. Base restrictions on fishing in Garrison Slough and the consumption of fish from Garrison Slough will continue until fish tissue PCB concentrations are reduced to acceptable levels.

Results of confirmation sample analyses indicate that remedial goals for soil and sediment within Garrison Slough and the adjacent drainage ditch have been met. The USAF, EPA, and ADEC project managers concur that the Garrison Slough remedial actions are successful and that the Air Force should continue LTO of the ICs. The 1997 SWMP report (USAF 1998h) indicates that the PCB levels detected in fish have declined in the section of Garrison Slough where contaminated sediment was removed. The reduction of contaminants at SS67 is occurring at rates consistent with projected remediation times.

LTO and maintenance of the remedies for the Sitewide Unit will remain in effect until cleanup goals are achieved. The Sitewide remedies remain protective of human health and the environment and are functioning as designed. These remedies will be addressed in future periodic reviews and, if necessary, further actions will be evaluated.

3.0 AREAS Of NON-COMPLIANCE

No areas of non-compliance were identified during this review.

4.0 RECOMMENDATIONS

All remedies remain protective of human health and the environment. The remedial systems are operating and functioning as designed and no modifications are required.

5.0 NEXT FIVE-YEAR REVIEW

Future five-year reviews are necessary because contamination remains above levels that allow for unrestricted use and/or unlimited exposure at OU1, OU2, OU3,4,5, OU6, and the Sitewide Unit. The next five-year review will be completed by August 2003.

The Air Force certifies that the remedies selected for this site remains protective of human health and the environment.

Tommy F. Crawford

TOMMY F. CRAWFORD
Brigadier General, USAF
Commander

19 Jan 99
Date

The Environmental Protection Agency certifies that the remedies selected for this site remains protective of human health and the environment.

_____ _____

RANDALL F. SMITH, Director Date
Office of Environmental Cleanup
Region 10

The Alaska Department of Environmental Conservation concurs that the remedies selected for this site remains protective of human health and the environment.

JENNIFER ROBERTS
Section Manager, Contaminated Sites

Date

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