United States Air F rce
611th Air Support Group
611th Civil Engineer Squadron

Elmendorf AFB, Alaska

DECISION DOCUMENTS AND NO FURTHER RESPONSE ACTION PLANNED DOCUMENT

Murphy Dome
Long Range Radar Site
Alaska

May 1996

United States Air F rce
611th Air Support Group
611th Civil Engineer Squadron

Elmendorf AFB, Alaska

DECISION DOCUMENTS AND NO FURTHER RESPONSE ACTION PLANNED DOCUMENT

Murphy Dome
Long Range Radar Site
Alaska

May 1996

Prepared by:

Woodward-Clyde Federal Services
3501 Denali St., Suite 101
Anchorage, AK 99503

TABLE OF CONTENTS

LIST OF APPENDICES

MURPHY DOME DECISION DOCUMENTS

INTRODUCTION

Three decision documents (DDs) have been prepared for the United State Air Force (USAF) - 611 Civil Engineering Squadron (CES) for a No Further Action (NFA) finding for three Installation Restoration Program (IRP) Sites at Murphy Dome Long Range Radar Site (LRRS), Murphy Dome, Alaska.

- White Alice Site (OT06)
- Road Oiling (OT05)
- Landfill No. 2 (LF04)

The NFA findings are presented in a No Further Response Action Planned (NFRAP) document included in Appendix A. The NFRAP document, which discusses the findings of previous environmental investigations, regulatory criteria, contaminant toxicity, potential exposure routes to human and sensitive ecological receptors and the results of Environmental Risk Assessment (ERA) and the Human Health Risk Assessment (HHRA), evaluates various site criteria to reach an NFRAP remedy selection. The associated DDs, which include a brief description of site findings, a description of the selected remedy, and a declaration of the intention of the NFRAP decision, are intended to serve as a record of decision for that remedy selection. Signatures on the DDs represent concurrence of a NFRAP finding for these IRP Sites at Murphy Dome LRRS.

The NFRAP findings were developed under the Air Force's IRP for the 611 Civil Engineering Squadron in accordance with Executive Order 12580, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended [42 USC 9601 et seq.] and the National Contingency Plan (NCP) [40 CFR 300.420]. Executive Order 12580 delegated the USAF as the lead agency for environmental restoration at non-NPL installations. The USAF actively follows CERCLA and NCP guidelines for environmental restoration at these installations under the Defense Environmental Restoration Program (DERP).

The USAF and the 611 CES are committed to a proactive community relations program for IRP activities at the Murphy Dome LRRS. The USAF is seeking community involvement and regulatory concurrence with the NFA remedy selection. Supporting correspondence from the Alaska Department of Environmental Conservation (ADEC) is included in Appendix B. The Murphy Dome LRRS Administrative Record Index is included in Appendix C.

DECISION DOCUMENT
DECLARATION OF NO FURTHER RESPONSE ACTION PLANNED

United States Air Force
611 Air Support Group
Installation Restoration Program (IRP)

Site Name and Location

White Alice Site (OT06)
Murphy Dome Long Range Radar Site
Fairbanks, Alaska

Statement of Basis and Purpose

This decision document (DD) presents the December 1994 No Further Response Action Planned (NFRAP) findings which supports a decision of no further investigation or environmental restoration for the White Alice Site (OT06) at Murphy Dome LRRS. The NFRAP document was developed under the Air Force's IRP for the 611th Civil Engineering Squadron in accordance with Executive Order 12580, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended [42 USC 1901 et seq.] and the National Contingency Plan (NCP) [40 CFR 300.420]. The NFRAP presents information in support a no further action alternative through an evaluation of site contaminants, regulatory criteria, contaminant toxicity, and potential exposure routes to human and sensitive ecological receptors.

Site Findings

The White Alice Site was used by the USAF from the late 1950s until the 1970s. Electrical transformers containing PCB dielectric fluids were probably used at this site. Leaks or spills from on-site transformers may have contaminated this site. Analytical results from soil samples collected during a 1992 site investigation indicated the presence of seven potentially hazardous compounds including PCBs and pesticides. The results of the 1993 Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA) included a detailed evaluation of contaminant toxicity, potential exposure

routes, and potential human and sensitive ecological receptors at Site OT06. The findings of the ERA and HHRA indicated that the low levels of contaminants detected at OT06 does not pose a significant threat to human or sensitive ecological receptors.

Description of Selected Remedy

Based on the findings of the 1992 site investigation and an evaluation of potential risk, it has been determined that Site OT06 does not pose a significant threat to human health or the environment at Murphy Dome. Therefore, no further action under CERCLA and the NCP is required.

Declaration

This DD represents the selected action for this site developed in accordance with CERCLA, as amended. USAF Executive Order 12580 has mandated that environmental restoration decisions will comply with the NCP and the Defense Environmental Restoration Program (DERP), which effectively follows NEPA guidelines. The NFRAP decision for Site OT06 was developed under CERCLA and NCP guidance and is considered to be protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost-effective. The statutory preference for further treatment or action is not satisfied and therefore no further actions is necessary or appropriate for IRP Site OT06.

Samuel C. Johnson III

SAMUEL C. JOHNSON III, Colonel, USAF
Commander, 611 Air Support Group

JUL 19 1996
Date

DECISION DOCUMENT
DECLARATION OF NO FURTHER RESPONSE ACTION PLANNED

United States Air Force
611 Air Support Group
Installation Restoration Program (IRP)

Site Name and Location

Road Oiling (OT05)
Murphy Dome Long Range Radar Site
Fairbanks, Alaska

Statement of Basis and Purpose

This decision document (DD) presents the December 1994 No Further Response Action Planned (NFRAP) findings which support a decision of no further investigation or environmental restoration for the Road Oiling (OT05) at Murphy Dome LRRS. The NFRAP document was developed under the Air Force's IRP for the 611 Civil Engineering Squadron in accordance with Executive Order 12580, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended [42 USC 9601 et seq.] and the National Contingency Plan (NCP) [40 CFR 300.420]. The NFRAP presents information in support a no further action alternative through an evaluation of site contaminants, regulatory criteria, contaminant toxicity, and potential exposure routes to human and sensitive ecological receptors.

Site Findings

There are approximately two miles of gravel road at the Murphy Dome installation which were sprayed with waste oils and other shop waste for dust control and as a method of waste disposal from the 1950s until the 1970s. Analytical results from soil samples collected during a 1993 site assessment indicated the presence of the pesticide p,p,-DDT. No other pesticides or PCBs were detected. Numerical soil cleanup levels for DDT compounds have not been established by the USEPA or ADEC.

The results of the 1993 Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA) included a detailed evaluation of contaminant toxicity, potential exposure routes, and potential human and sensitive ecological receptors at Site OT05. The findings of the ERA and HHRA indicated that the low levels of contaminants detected at OT05 does not pose a threat to human or sensitive ecological receptors.

Description of Selected Remedy

Based on the findings of the 1993 site assessment and an evaluation of potential risk, it has been determined that Site OT05 does not pose a threat to human health or the environment at Murphy Dome. Therefore, no further action under CERCLA and the NCP is required.

Declaration

This DD represents the selected action for this site developed in accordance with CERCLA as amended. USAF Executive Order 12580 has mandated that environmental restoration decisions will comply with the NCP and the Defense Environmental Restoration Program (DERP), which effectively follows NEPA guidelines. The USAF follows the CERCLA and NCP guidelines for non-NPL USAF installations which are part of the DERP. The NFRAP decision for Site OT05 was developed under CERCLA and NCP guidance and is considered to be protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost-effective. The statutory preference for further treatment or action is not satisfied and therefore no further actions is necessary or appropriate for IRP Site OT05.

Samuel C. Johnson III

SAMUEL C. JOHNSON III, Colonel, USAF
Commander, 611 Air Support Group

JUL 19 1996
Date

DECISION DOCUMENT
DECLARATION OF NO FURTHER RESPONSE ACTION PLANNED

United States Air Force
611th Air Support Group
Installation Restoration Program (IRP)

Site Name and Location

Landfill No. 2 (LF04)
Murphy Dome Long Range Radar Site
Fairbanks, Alaska

Statement of Basis and Purpose

This decision document (DD) presents the December 1994 No Further Response Action Planned (NFRAP) findings which support a decision of no further investigation or environmental restoration for the Landfill No. 2 (LF04) at Murphy Dome LRRS. The NFRAP document was developed under the Air Force's IRP for the 611 Civil Engineering Squadron in accordance with Executive Order 12580, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended [42 USC 9601 et seq.] and the National Contingency Plan (NCP) [40 CFR 300.420]. The NFRAP presents information in support a no further action alternative through an evaluation of site contaminants, regulatory criteria, contaminant toxicity, and potential exposure routes to human and sensitive ecological receptors.

Site Findings

Landfill No. 2 is located off the installation property, adjacent to the Murphy Dome Road, about 6 miles from the installation. The landfill covers and area of approximately 1 acre and was used solely by the USAF from 1970 to 1978 for disposal of garbage, rubbish, incinerator ash, wood, plastic, metal, shop waste, drums, and miscellaneous debris. Analytical results from two soil samples collected at the landfill during the 1003 site assessment indicated the presence of some metals, presumably at approximately

background levels, with the exception of lead. Lead was detected at higher concentrations than background levels. Pesticides and PCBs were not detected.

The results of the 1993 Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA) included a detailed evaluation of contaminant toxicity, potential exposure routes, and potential human and sensitive ecological receptors at Site LF04. The findings of the ERA and HHRA indicated that the low levels of contaminants detected at LF04 does not pose a threat to human or sensitive ecological receptors.

Description of Selected Remedy

Based on the findings of the 1993 site assessment and an evaluation of potential risk, it has been determined that Site LF04 does not pose a threat to human health or the environment at Murphy Dome. Therefore, no further action under CERCLA and the NCP is required.

Declaration

This DD represents the selected action for this site developed in accordance with CERCLA as amended. USAF Executive Order 12580 has mandated that environmental restoration decisions will comply with the NCP and the Defense Environmental Restoration Program (DERP), which effectively follows NEPA guidelines. The USAF follows the CERCLA and NCP guidelines for non-NPL USAF installations which are part of the DERP. The NFRAP decision for Site LF04 was developed under CERCLA and NCP guidance and is considered to be protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate, and is cost-effective. The statutory preference for further treatment or action is not satisfied and therefore no further actions is necessary or appropriate for IRP Site OT05.

Samuel C. Johnson III

SAMUEL C. JOHNSON III, Colonel, USAF
Commander, 611 Air Support Group

JUL 19 1996
Date

APPENDIX A

NO FURTHER RESPONSE ACTION PLANNED DOCUMENT

MURPHY DOME LRRS, ALASKA

United States Air Force
611th Air Support Group
611th Civil Engineer Squadron

Elmendorf AFB, Alaska

FINAL

No Further Response Action Planned Document Murphy Dome LRRS, Alaska

Prepared by

Woodward-Clyde

December 1994

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

Section — Page

LIST OF TABLES

LIST OF FIGURES

1.0
INTRODUCTION

This report constitutes a "No Further Response Action Planned (NFRAP)" Document for three sites at Murphy Dome Long Range Radar Site (LRRS), Alaska. It has been prepared in accordance with the "Draft ADEC No Further Action Criteria for DOD Military/FUD Sites," dated June 8, 1992.

The U.S. Army Corps of Engineers (COE), Alaska District was requested to assist the 611 CES/CEVR (Elmendorf AFB, Alaska) with a Site Assessment (SA) for the Murphy Dome LRRS, Alaska. Woodward-Clyde (WC) was contracted by the COE to perform the SA and an NFRAP document under Contract No. DACA67-92-D-1017, Delivery Order No. 0020. WC submitted the Draft SA report in February 1994.

This NFRAP Document serves as a record that no further assessment or remediation is necessary at the Road Oiling (OT05), White Alice (OT06), and Landfill No. 2 (LF04) sites at Murphy Dome LRRS. It demonstrates, through discussions of the sites' history, location, climate, hydrogeology, environmental investigations (including soil and water sampling), land use, and ecological and human health risk assessments, that the three sites pose no significant risk to humans or the environment.

This NFRAP Document is organized into eight sections. Background information on the installation and study sites is presented in Section 2.0. Section 3.0 discusses the environmental setting. A summary of site data comprises Section 4.0. Section 5.0 discusses exposure routes. Receptors and toxicity are in Section 6.0 and 7.0, respectively. Finally, Section 8.0 summarizes an evaluation of risk and section 9.0 lists references. Tables and figures follow the sections in which they have been referenced, and appendices have been incorporated at the end of the report.

2.0
GENERAL INFORMATION

2.1 INSTALLATION BACKGROUND

2.1.1 Location Description

Murphy Dome LRRS is an 846-acre radar site located 20 miles west-northwest of Fairbanks. The station is on top of a rounded mountain dome (elevation 2,930 feet) and is accessible via Sheep Creek Road and Murphy Dome Road. A location map is presented as Figure 2.1. A vicinity map, showing the topography of the station and surrounding area, is presented as Figure 2.2.

2.1.2 History

Murphy Dome LRRS was the North Alaska Control Center as well as being one of twelve original Aircraft Control and Warning installations constructed to establish a permanent air defense system in Alaska. Site construction was completed in 1951, and the facility became operational in the spring of 1952. In 1960 a radio relay station (White Alice) was added to the installation, but was deactivated in 1979. A permanent force of approximately 140 military personnel and 12 civilian personnel manned the station until 1977, when contractor support personnel replaced most of the military residents. In 1983 the station began using satellites to transmit radar data and the station was operated by only 10 people. In 1986 Murphy Dome was converted to a minimally-manned radar station that required no personnel to live at the site. In 1987 all structures except two radar domes, a Federal Aviation Administration (FAA) building, and the White Alice building were demolished and buried on site.

Potable water was supplied to the station from a well in a valley approximately 7,900 feet east-northeast of the station's main complex. The water well was abandoned in the 1980s and all piping, pumps, and appurtenances were removed during the 1987 site demolition. Sewage from the main complex was piped to two septic tanks approximately 1,000 feet

downhill to the northwest. Demolition personnel recall that the septic tanks were filled with concrete and abandoned in place.

An incinerator was often used to burn flammable waste, at least during the 1970s. Other wastes from the station and ashes from the incinerator were placed in on-site landfills. Prior to 1972, waste oils and solvents were spread on the station roads during summer months for dust control. After 1972, waste oils and other potentially hazardous wastes were removed off-site for disposal.

Electrical power was purchased from the U.S. Army, but backup power was supplied by an on-site power plant housing eleven 100 KW diesel-powered generators. Fuel was primarily stored in two above ground tanks. Steam heat was generated for the station by three diesel powered boilers. Fuel oil for emergency generators in the White Alice Building was supplied from a 2,000-gallon underground storage tank (UST) approximately 40 feet southwest of the White Alice Building.

The current military mission of the Interior LRRS is for peacetime air surveillance as part of the Alaska Radar System (ARS) of the overall North American Air Defense (NORAD) Mission. The installations are subordinate to the 611 Air Support Group (611 ASG) which is headquartered at Elmendorf AFB. The installations are directly linked via satellite to the Regional Operations Control Center (ROCC) at Elmendorf AFB in Anchorage. Piquniq Management Corporation presently contracts with the Air Force to provide one person for Murphy Dome LRRS operation and maintenance.

2.1.3 Previous Investigations

Six investigations or studies, including the 1993 Site Assessment, have been performed at Murphy Dome LRRS. The resulting reports are listed below, followed by a summary of each investigation.

- *Installation Restoration Program, Phase I - Records Search AAC - Northern Region: Galena AFS, Campion AFS, Cape Lisburne AFS, Fort Yukon AFS, Indian Mountain AFS, Kotzebue AFS, Murphy Dome AFS and Tin City AFS* (Engineering Science (ES) 1985)

- *Installation Restoration Program, Phase II - Confirmation/Quantification, Stage 1 Campion, Fort Yukon, Galena, Indian Mountain, Murphy Dome, Cold Bay, and Sparrevohn Air Force Sites* (Woodward-Clyde (WC) 1988)

- *Installation Restoration Program, Stage 1, Phase II Site Inspections Report for Fort Yukon, Murphy Dome, and Indian Mountain Air Force Sites, Alaska* (WC 1990)

- *Preliminary Assessment, Murphy Dome LRRS Site* (USAF - 611 CEOS/DEVR 1992)

- *Site Investigation Report, Murphy Dome LRRS, Alaska* (WC 1993)

- *Draft Site Assessment Report, Murphy Dome LRRS, Alaska* (WC 1994)

2.1.3.1 Installation Restoration Program, Phase I - Records Search (ES 1985)

Personnel reviewed records and conducted interviews with former and current (at that time) employees at the installation to identify sites of potential or actual contaminant releases. No sampling or analysis was performed during this phase. The study identified waste accumulation areas, landfills, areas outside of industrial buildings, and sites of recorded fuel spills.

The records search included an assessment of hazards and potential hazards, based on material released and a review of regional geological and hydrogeological factors. Sites were then ranked. The following sites had the highest hazard potential and were recommended for additional investigation:

- Waste Accumulation Area No. 1 and Bulk Fuel Storage Area
- Waste Accumulation Area No. 2
- Waste Accumulation Area No. 3
- White Alice Site
- Road Oiling
- Landfill No. 1
- Landfill No. 2

2.1.3.2 Installation Restoration Program, Phase II - Confirmation/Quantification, Stage 1 (WC 1989)

WC collected samples at Landfill No. 2 in 1986 and 1987.

2.1.3.3 Installation Restoration Program, Stage 1, Phase II Site Inspection (WC 1990)

A team of Air Force officers, WC personnel, and a representative of the Alaska Department of Environmental Conservation (ADEC) performed a site visit at Murphy Dome LRRS on July 17, 1990 . The team investigated the summit area, the White Alice Site, Landfill No. 1, and Landfill No. 2, and collected a composite soil sample at the White Alice Site.

2.1.3.4 Preliminary Assessment (USAF, 1992)

The USAF prepared a Preliminary Assessment (PA) on behalf of the U.S. Environmental Protection Agency (USEPA) - Region 10. The PA identified potential contamination sources and described various site characteristics pertaining to risks of contaminant migration and exposure. The USEPA estimated Hazard Ranking System (HRS) scores using the PA information and concluded that Murphy Dome LRRS received a sufficiently high score to warrant a Site Investigation.

2.1.3.5 Site Investigation (WC 1993)

WC performed a site investigation in 1992 to gather analytical data requested by the USEPA. A WC team collected soil samples from the White Alice Site, and collected sediment samples to evaluate surface water runoff to Dawson, Keystone, Cache, and Goldstream Creeks.

2.1.3.6 Site Assessment (WC 1994)

WC performed a site assessment in 1993 to investigate potential contamination sources/sites and to evaluate and categorize the sites as requiring no further action, further investigation, or remedial action. A WC team collected environmental samples from the surface soil, subsurface soil, and surface water for six individual study sites on the installation.

2.2 NFRAP SITES BACKGROUND

Figure 2.3 is a map of Murphy Dome LRRS. The White Alice Site and the Road Oiling areas are identified on Figure 2.3. Landfill No. 2, which is located off of the installation property, is identified on Figure 2.2.

2.2.1 White Alice (OT06)

2.2.1.1 Description

The White Alice Site is located on the southeast slope of Murphy Dome. The structures at the site consisted of a 40- by 80-foot rectangular building (Building No. 1001, which is still standing) and a radio relay tower. Fuel was stored in a 2,000-gallon tank buried approximately 40 feet southwest of the building, and a small septic tank was located approximately 50 feet southwest of the building and 15 feet west of the fuel tank.

2.2.1.2 History

The White Alice Site was used by the USAF from the late 1950s until the 1970s. A radio relay station was constructed in 1960 and was deactivated in 1979 when a satellite communications system was installed at Murphy Dome. Electrical transformers containing PCB were possibly used at the site; however, there are no known spills of PCB at Murphy Dome.

In 1987, most of the structures were demolished and buried on site during a general cleanup of the installation. Remaining structures include a Federal Aviation Administration (FAA) building, two radar domes (one USAF and one FAA), and a White Alice support building. The underground fuel storage tank associated with the White Alice support building was removed in September 1993. The Alascom communications company now occupies the facility.

2.2.2 Road Oiling (OT05)

2.2.2.1 Description

There were approximately two miles of gravel road on Murphy Dome LRRS. The roads surrounded the main complex and led to the landfills, access road, helicopter pad, and sewage system.

2.2.2.2 History

From approximately 1951 to 1972 waste oils and other shop wastes were applied to roads for dust control and as a method of waste disposal.

2.2.3 Landfill No. 2 (LF04)

2.2.3.1 Description

Landfill No. 2, located off the installation property, lies adjacent to Murphy Dome Road (see Figure 2.2). The site is about 6 miles from the installation on the north side of the road. The landfill covers approximately 1 acre and is located at an elevation of 1,075 feet, on a wide rounded ridge sloping 10 degrees to the south. Below Murphy Dome Road, the ridge slopes 15 degrees to a ravine 0.5 mile from the road.

The surface of the landfill is generally flat, sloping slightly to the southeast. The surface is oval shaped, 300 feet long and 150 feet wide. Bedrock is exposed in a shallow cut along the northwest margin. The downslope margin to the southeast terminates in a steep fill slope, 5 to 12 feet high.

The 1989 IRP report (WC 1989) noted that a small amount of debris, partially incorporated in the fill cover, was exposed at the southeast margin. The debris included empty 55-gallon drums and ammunition boxes. Markings on one drum indicated SAE 50 oil; others were not distinguishable. All the drums were riddled with bullet holes.

The 1989 report also recorded that the top of the landfill was mostly covered with crushed weathered bedrock. Native grasses to 3-feet high covered about one-half of the surface. A surface water pond 20 feet in diameter and 6-inches deep was noted. One prominent surface stain appeared to have resulted when a vehicle's engine oil was changed. There was no ground staining or other surficial evidence of contaminant migration downslope of the fill.

Surface runoff from the landfill flows south and is intercepted by a drainage ditch paralleling Murphy Dome Road. No specific information was found pertaining to subsurface conditions at the site. The depth to groundwater or bedrock is unknown. Due to the site's slope orientation and the types of vegetation surrounding the landfill, it is unlikely that there is permafrost beneath the site. Small perennial springs have been observed within a mile of the site.

The current owner-of-record for the landfill is the North Star Borough, headquartered in Fairbanks. The property was transferred to the borough from the Alaska Department of Natural Resources. The property east of the landfill belongs to the University of Alaska and is undeveloped.

2.2.3.2 History

The landfill was used solely by the USAF from 1970 to 1978 for disposal of garbage, rubbish, incinerator ash, wood, plastic, metal, shop waste, drums, and miscellaneous debris. The landfill may also have been used as a dump by other parties. Some refuse was burned on location at the landfill. Fill depths were reported to be 8 to 10 feet. The site was used as a gravel borrow pit prior to becoming a landfill.

The IRP Phase II, Stage 1 Report (WC 1989) stated that the landfill used to be guarded by armed sentries during periods of operation, and according to an affidavit from the Alaska Department of Natural Resources (DNR) the landfill may contain live ammunition.

During preparation of this NFRAP document, an attempt was made to locate and review the above affidavit. Personnel at DNR (Craig 1994 and Milles 1994) and at the property management office of the North Star Borough (Grandfield 1994 and Hancock 1994) were contacted, but they had no records or knowledge of the existence of this affidavit or of

ammunition being dumped or stored at the landfill. Also contacted were personnel at WC who had been involved with the 1989 report. They had no knowledge or recollection of this affidavit or of reports of ammunition disposal. It now appears doubtful that the affidavit exists.

A review of ADEC solid waste records for the site indicates that the landfill operated without a solid waste management permit until 1978, the last year of operation. Records show that the ADEC issued a permit to the USAF on June 1, 1978 with an expiration date of September 30, 1978.

Conditions of the permit included closure and restoration of the landfill not later than September 30, 1978. Restoration was to consist of covering the deposited wastes with at least two feet of compacted soils and grading the resultant surface to promote runoff without erosion. The ADEC records review did not produce any records documenting actual landfill closure.

2.3 OTHER SOURCES AT MURPHY DOME LRRS

Several other sites have been investigated at Murphy Dome LRRS. These sites, shown on Figure 2.3, do not appear to be located in hydrogeological situations which would impact the three subject sites of this NFRAP Document. The sites are:

- Landfill No. 1 (LF03)
- Waste Accumulation Area No. 2 (SS01)
- Waste Accumulation Area No. 3 (SS02)
- Waste Accumulation Area No. 1 and Bulk Fuel Storage Area (SS07)

The latter is the closest site to the subject areas. Two spills of diesel fuel were reported to have occurred from the fuel storage tanks. A 2,500-gallon spill occurred sometime between 1970 and 1974, and a 7,500-gallon spill occurred in 1981. Most of the fuel (6,800 gallons) was recovered from the 1981 spill, and a 1-foot depth of soil inside the berm was removed and disposed of off site.

No other sites at Murphy Dome LRRS are expected to impact the Road Oiling, White Alice, or Landfill No. 2 sites.

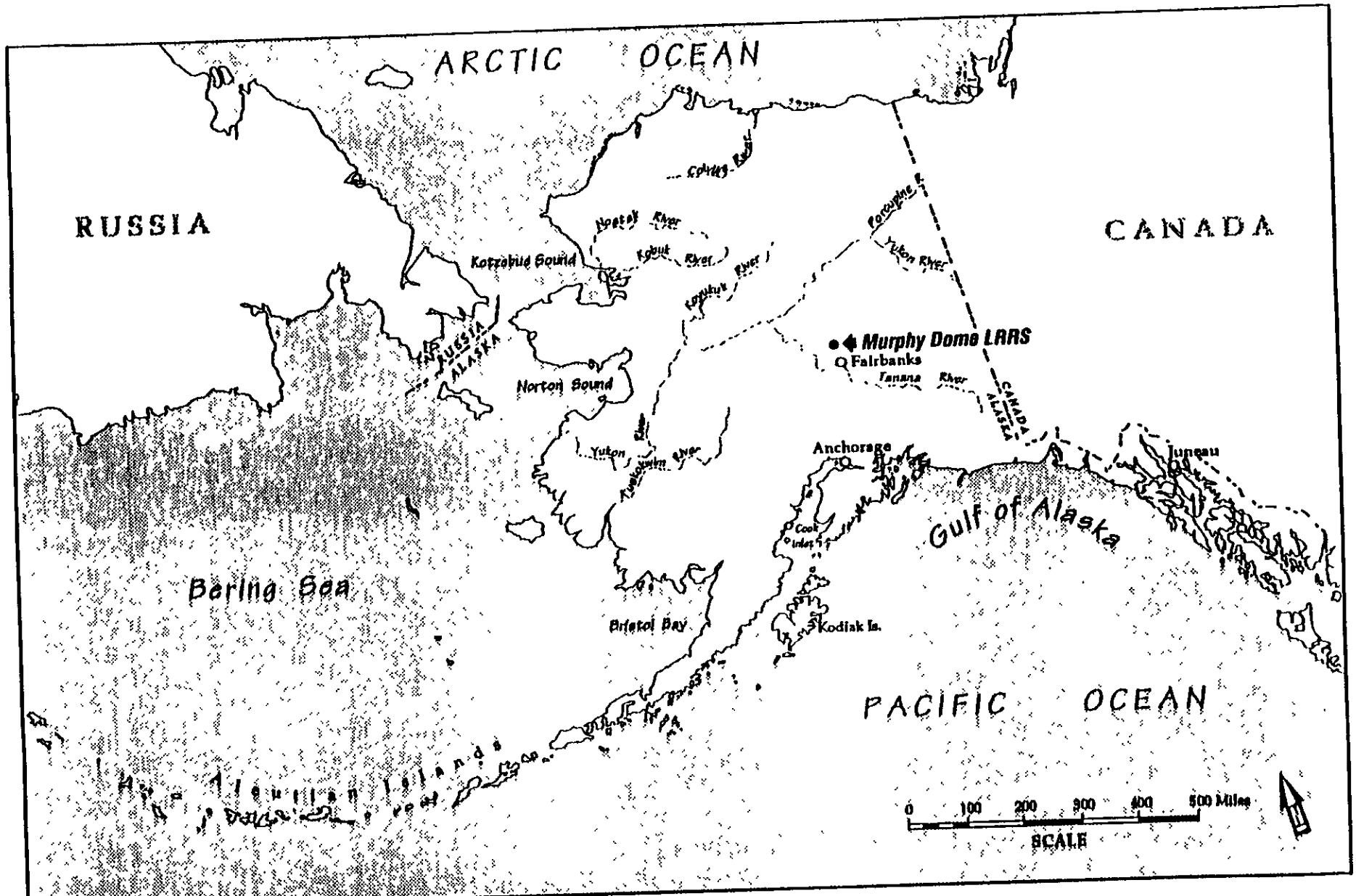

Figure 2.1 LOCATION MAP - MURPHY DOME LRRS

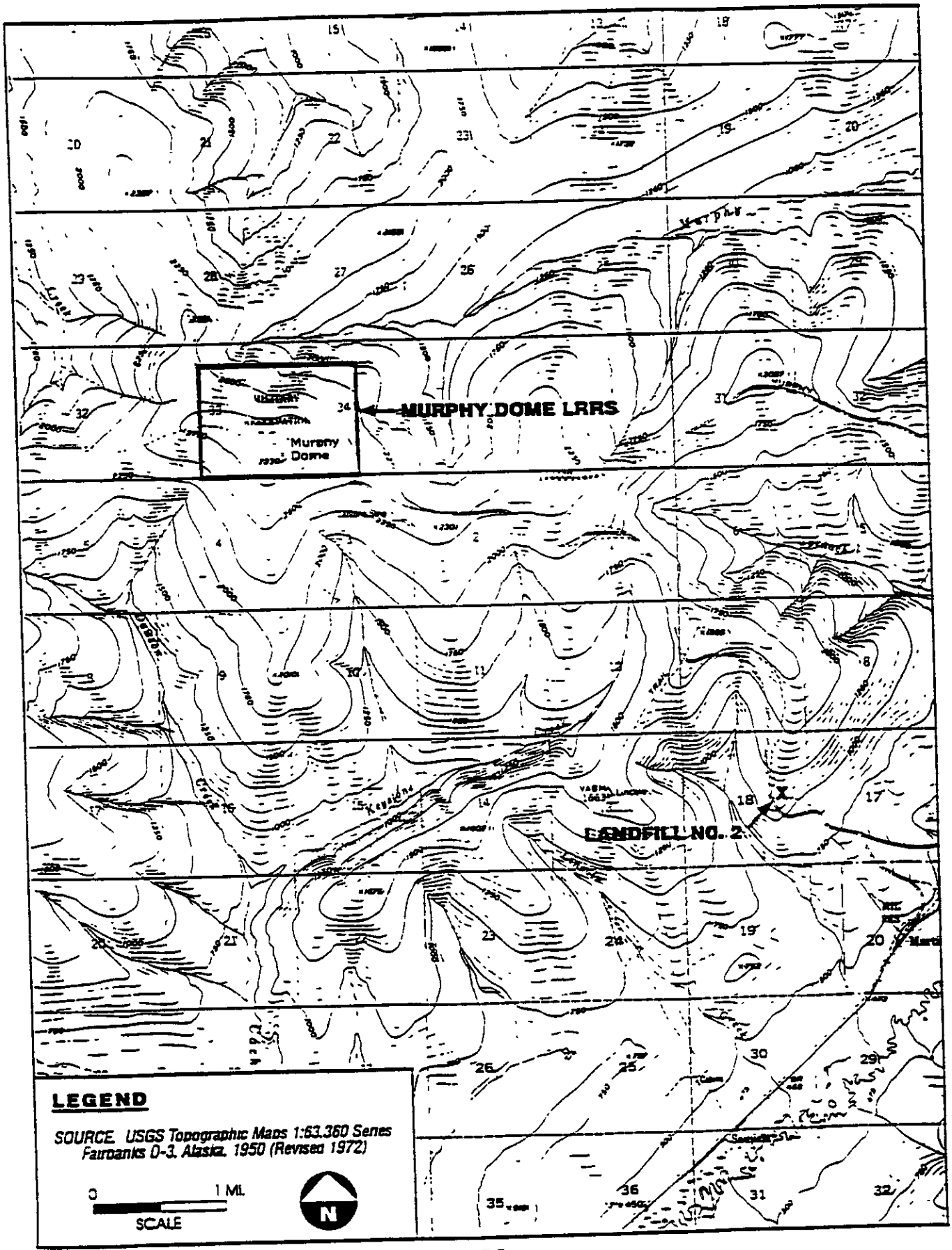

Figure 2.2 VICINITY MAP – MURPHY DOME LRRS

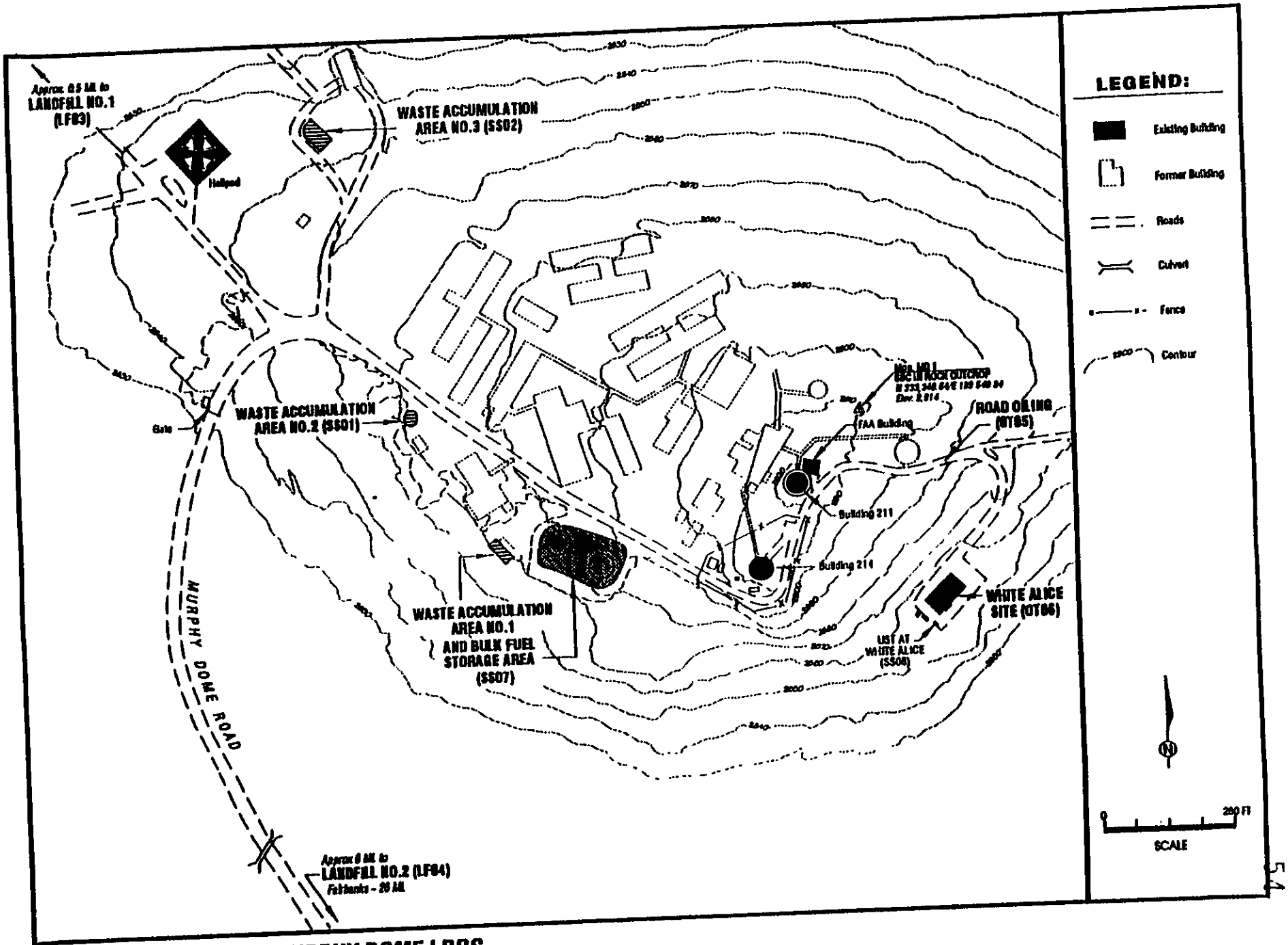

Figure 2.3 SITE MAP – MURPHY DOME LRRS

54 31

3.0 ENVIRONMENTAL SETTING

3.1 SURFACE FEATURES

Murphy Dome is located in a belt of hills which lies between the Chatanika River valley to the north and the broad Chena-Tanana valley several miles to the south. Murphy Dome is one of the highest hills in the vicinity at an approximate elevation of 2,900 feet. The region is well drained by the various branches of the Chatanika River and its tributary, Goldstream Creek, and by various other minor tributaries of the Tanana River. Regionally, the area is situated within the Yukon-Tanana Uplands, an area of ridges and valleys lying between the Brooks Range on the north and the Alaska Range on the south. The Tanana River Valley separates the Alaska Range from the Yukon-Tanana Upland mountain groups.

3.2 CLIMATE

The climate of the Murphy Dome area is characteristic of the Fairbanks area. Summer temperatures generally range from 35° to 72°F, and winter temperatures are usually -22° to 26°F. Temperature extremes recorded in Fairbanks have been -61° and 99°F. The mean annual temperature is below freezing.

The area receives measurable precipitation on more than 100 days per year. The average annual precipitation is about 10 to 15 inches which includes about 70 inches of snow. Although precipitation is light, evaporation is low and discontinuous permafrost forms an impervious layer so that bogs and wet areas are common. Snow cover usually persists from mid-October until mid- to late- April (Viereck and Little 1972). Winds are generally from the north and average 5.4 knots.

3.3 GEOLOGY AND SOILS

The geology of the Murphy Dome area is characterized by thin residual deposits overlying metamorphic bedrock. The bedrock comprising the hills of the area is the Birch Creek schist, considered to be of Precambrian age. The bedrock is highly folded and faulted.

Overburden on the higher slopes consists of a layer of residual soil ranging in thickness from a few inches to a few feet. Much of the bedrock is overlain by late Quaternary deposits of loess or silt which were transported by wind from glacial outwash areas in the Alaska Range to the south. Alluvial sand and gravel deposits have accumulated in lowland areas and in local stream valleys. The thickness of the alluvium is highly variable. The underlying bedrock crops out along steep slopes and eroded mountain surfaces.

Based on various geotechnical investigations by the Corps of Engineers, unconsolidated deposits beneath the Murphy Dome site consist of silty sand and schist gravel with some boulders. Percolation tests indicate that the soil is highly permeable. Bedrock is hard quartzite schist which lies at depths ranging from 2 to 10 feet. Test pits and borings have found no evidence of perched aquifers or permafrost above the bedrock on the top of Murphy Dome.

Permafrost in the area is common but discontinuous. Local variations in thickness, areal extent, and temperature of permafrost depend on local differences in the rate of heat flow, climate, topography, slope orientation, vegetation, geology, and hydrology. Test borings completed for various projects in the area have encountered permafrost as shallow as 2.5 feet in stream valleys, while south-facing slopes in the area are generally free of permafrost. Because of sun exposure, it is unlikely that the top of Muphy Dome is underlain by permafrost.

3.4 SURFACE WATER HYDROLOGY

Much of the snow that falls on the Murphy Dome summit probably blows off, and hard rainfalls tend to travel off site as surface runoff. The upper limit of precipitation that actually percolates into the soil has been estimated at about 50 percent (Swanson, Soil Conservation Service, 1993). Because of the geology of the dome summit, water that does percolate into the soil probably seeps out to surface water within short distances.

Receiving waters from unnamed channels to the north are Murphy and Shovel Creeks (see Figure 2.2). To the south, surface drainage is to Dawson and Keystone Creeks, which both discharge to Cache Creek and then into Goldstream Creek. Drainage information obtained during the Preliminary Assessment (PA) is presented below:

Drainage Basin	Precipitation (inches/year)	Drainage Area (square miles)	Mean Annual Streamflow (cfs)
Dawson Creek	10.9	6.99	1.9
Keystone Creek	10.9	7.05	2.0
Murphy/McCloud Cr.	10.9	30.5	9.1

The Murphy Dome area is in the 500-year floodplain category.

Very little land surrounding Murphy Dome LRRS is considered wetlands. The United States Fish and Wildlife Service (1992) has identified small wetland habitats along all Murphy Dome drainages, including Murphy, Dawson, Keystone, Cache, and Shovel Creeks (Figure 3.1). There are extensive riparian wetlands along Goldstream Creek approximately 7 miles southeast (downstream) of the facility.

3.5 HYDROGEOLOGY

The geology of Murphy Dome is dominated by thin residual deposits overlying metamorphic bedrock on the uplands and by relatively thick alluvial deposits in the stream valleys below the dome. The unconsolidated deposits are expected to have low to moderate permeability. Seasonal groundwater occurs in the residuum as a result of the melt and thaw cycle; perennial ground water occurs in the stream alluvium. Seasonal groundwater discharge is likely directed downslope from the installation area to local surface streams. The principal groundwater flow directions probably mirror the area's surface topography; to the north, east and south. The Phase I IRP Record Search (1985) determined that there are no regional aquifers beneath the site.

Permafrost is discontinuous in the installation study area. Where permafrost exists, groundwater may migrate laterally as supra-permafrost water following the slope of the permafrost surface. Groundwater may appear as springs where it intersects the land surface. Groundwater may also move along the surface of the shallow bedrock on the dome.

Murphy Dome LRRS previously obtained water from a well located about one mile from the facility. The well was 70 feet deep and was presumably screened in the alluvium of Murphy Creek. The well was abandoned in 1987 after the White Alice Site was deactivated. There are no known wells within 5 miles of Murphy Dome LRRS.

3.6 DEMOGRAPHY AND LAND USE

Demography

Fairbanks, located 20 miles from Murphy Dome LRRS, is the second largest city in Alaska. It is the only major terminus for rail, air, and highways in interior Alaska. The Fairbanks North Star Borough is largely non-industrial and remains primarily dependent on local, state, and federal government employment. Military personnel stationed at several installations in the Borough also contribute heavily to the economy. The University of Alaska is also an important employer. Personnel employed at the LRRS commute from Fairbanks and are not housed on site.

No humans were found residing within 0 - 1 miles or 1 - 5 miles from Murphy Dome LRRS. Some residences probably occur within 5 - 20 miles, primarily near Fairbanks. With the exception of the radar maintenance workers, there are no people residing, working, or attending school or day care within 500 feet of any source.

Land Ownership

The current land ownership is shown in Figure 3.2. All of Sections 33 and 34 (T2N R4W) that surround Murphy Dome are held by the Federal government. Lands outside of these two sections are held by the Fairbanks North Star Borough and the State of Alaska. The State lands are part of the Tanana Valley State Forest and the Borough lands are classified as Public Use. A tract near Landfill No. 2 is classified as Potential Forest Property. With the transfer of former Federal property to the Fairbanks North Star Borough around Landfill No. 2 (T1N R3W Section 18), the State of Alaska retained the rights to mine gravel at this site. The State is allowed access to about 20 to 25 acres for gravel extraction.

Current Land Use

The Murphy Dome area is easily accessible by car from Fairbanks and has been subject to hunting pressure by local residents. Hunting, trapping, and fishing activities are conducted

in interior Alaska according to sport hunting and fishing regulations established by the Alaska Department of Fish and Game (ADF&G). Subsistence hunting and fishing are conducted by local native populations, but not by LRRS contract or DOD personnel.

Outdoor recreation at Murphy Dome LRRS also consists of local residents involved in such activities as hiking, bird watching, and all-terrain vehicle (ATV) riding. Extensive ATV tracks on tundra vegetation were noted in the Murphy Dome area; however, most ATV riding on the installation is restricted to designated roads. The area is also used as a parking lot by nearby private landowners, backpackers and hikers, and bird watchers. School children from Fairbanks and students from the University of Alaska, Fairbanks are taken to Murphy Dome for biology classes and field exercises in the alpine tundra habitat. As a result of this easy access and the proximity to Fairbanks, the area may also be used for impromptu parties and weekend beer "bashes." The trails that run through the Murphy Dome area are utilized by mushers and skiers in the wintertime and are closed to the use of motorized vehicles.

Future Land Use

With the reduced military threat from the former Soviet Union and current reductions in DOD budgets, the mission and staffing of contract personnel at Murphy Dome LRRS are likely to remain at current levels or possibly be reduced during the next few years. Therefore, the use of natural resources by Air Force contractor personnel is expected to remain constant or decline slightly. The current pattern and location of land uses at Murphy Dome LRRS and climatic factors limit the installation's potential for expansion of natural resources. The constraints include IRP sites, the severe climate and a short growing season. It is expected that use of the area for hiking, bird watching, and other outdoor recreation by Fairbanks residents will increase. Murphy Dome LRRS is expected to be converted to an unmanned facility in 1999, but will remain government property.

The Borough lands classified as Public Use surrounding Landfill No. 2 are not expected to change status in the future. The lands south of Murphy Dome Road might be reclassified in the future and sold during land sales for subdivisions and cabins, but the Borough has not made a decision.

No potential exists for domestic livestock grazing or cropland management.

3.7 ECOLOGY

3.7.1 Plant Communities

The Murphy Dome LRRS site is dominated by alpine tundra vegetation. Lower elevation areas surrounding the site are characterized by upland spruce-hardwood forest. This is a fairly dense forest of white spruce (*Picea glauca*), birch (*Betula papyrifera*), aspen (*Populus tremuloides*), and balsam poplar (*Populus balsamifera*). Black spruce (*Picea mariana*) usually replaces this forest type on north-facing slopes and poorly drained flat areas. Aspen and birch are predominant on well-drained southern slopes (WC 1993).

Undergrowth normally consists of mosses and grasses on drier sites and brush on moist slopes. Typical undergrowth species are willow (*Salix spp.*), alder (*Alnus spp.*), ferns, wild rose (*Rosa acicularis*), high bush cranberry (*Viburnum edule*), lingonberry (*Vaccinium vitis-idaea*), raspberry (*Rubus idaeus v. strigosus*), currant (*Ribes triste*), Narrowleaf Labrador tea (*Ledum decumbens*), and horsetail (*Equiserum sp.*). Common species found at the LRRS include arctic lupine (*Lupinus arcicus*), crowberry (*Empetrum nigrum*), dwarf birch (*Betula nana*), several species of lichen, and prostrate willows (*Salix spp.*). Demolition and burial of abandoned structures in 1988 and 1989 resulted in a large area of disturbance. This area was reseeded and has achieved fairly good ground cover. Common species in the reseeded area include yarrow (*Achillea borealis*), reedgrass (*Calamagrostis sp.*), bluegrass (*Poa spp.*), and several sedge (*Carex spp.*) species (WC 1993).

3.7.2 Wildlife

Fish The Alaska Department of Fish and Game (ADF&G 1990) Stream Atlas has identified no significant salmon-producing streams in the Murphy Dome area. The nearest productive fishing area is the Tanana River, which is over 10 river miles south of the installation. Minor streams in the area include Murphy, Shovel, Dawson, Keystone, Cache, and Goldstream Creeks and their tributaries. Fish species likely to be found in these creeks include Arctic grayling (*Thymallus arcticus*), whitefish (*Coregonus sp.*), northern pike (*Esox lucius*), and longnosed sucker (*Catostomus catostomus*) (ADF&G 1990).

Mammals Large mammals such as moose (*Alces alces*) and caribou (*Rangifer tarandus*) occur in the Murphy Dome area. Important seasonal moose habitats are lowland areas (spring thaw to late summer), and heath bog and tall shrub communities (late summer). On the Murphy Dome LRRS property, formerly disturbed areas provide suitable habitat for moose. Caribou migrate through the area each year and may forage on the tundra vegetation at the site. Wolves (*Canis lupus*) may occur in the Fairbanks area, while black bears (*Ursus arctos*) are widely distributed in the boreal forest and forest-tundra fringe habitats. Grizzly bear (*Ursus arctos*) densities are variable in the region (WC 1993).

The abundance of small mammals depends on habitat type. In the Fairbanks area, small mammals occur in highest abundance in tussock-low shrub bog habitat. Other suitable habitats include black spruce, tall shrub, white spruce-hardwood, and birch. The most common small mammals found at Murphy Dome include arctic ground squirrels (*Spermophilus undulatus kennicottii*), weasels (*Mustela sp.*), and voles (*Microtus* and *Clethrionomys sp.*). Other small mammals known to be present in the Fairbanks area include: snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus hudsonicus*), pine marten (*Martes americana*), least weasel (*Mustela rixosa*), short-tailed weasel (*Mustela erminea*), mink (*Mustela vison*), and lynx (*Felis lynx canadensis*) (WC 1993).

Birds Birds are typical of the interior alpine tundra and low shrub habitats. Species expected to occur at the Murphy Dome LRRS include white-crowned sparrow (*Zonotrichia leuophyrs*), alder flycatcher (*Empidonax alnorum*), cliff swallow (*Hirundo pyrrhonota*), rosy finch (*Leucosrite arctoa*), snow bunting (*Plectrophenax nivalis*), savannah sparrow (*Passerculus sandwichensis*), water pipit (*Anthus rubescens*), and horned lark (*Eremophila alpestris*).

Raptors common to interior Alaska include bald eagles (*Heliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*); northern harrier (*Circus cyaneus*); osprey (*Pandion haliaetus*); red-tailed hawk (*Buteo jamaicensis*); rough-legged hawk (*Buteo lagopus*) and sharp-shinned hawks (*Accepiter striatus*); gyrfalcon (*Falco rusticolus*); peregrine falcon (*Falco peregrinus*); merlin (*Falco columbirius*); American kestrel (*Falco sparverius*); great-horned owl (*Bubo virginianus*) and great grey owl (*Strix nebulosa*); northern hawk-owl (*Surnia ulula*), boreal owl (*Aegolius funereus*), and short-eared owl (*Asio flammeus*). Most of these are summer migrants only, and none are known to frequent the Murphy Dome LRRS (ANHP 1993).

The alpine tundra and low shrub habitats provide forage and cover for willow ptarmigan (*Lagopus lagopus*). Ptarmigan have been extensively hunted in the past and their numbers are reduced in the Murphy Dome area.

The creeks at the base of Murphy Dome may provide a limited habitat for waterfowl during the spring migration. The first spring migrants in the area usually appear in the third week of April.

3.7.3 Wetlands

The U.S. Fish & Wildlife Service (1992) has identified small riparian wetland habitats along all Murphy Dome drainages, including Murphy, Dawson, Keystone, Cache, and Shovel Creeks (Figure 3.1). There are extensive riparian wetlands along Goldstream Creek approximately 7 miles southeast of the facility.

3.7.4 Species/Areas of Special Concern

Murphy Dome is not contained within any designated federal, state, or locally protected sensitive environment location. No threatened, endangered, or sensitive species have been reported within the boundaries of the Murphy Dome LRRS. A records search conducted by the Alaska Natural Heritage Program (1993) revealed several protected species potentially occurring within the vicinity but not within Murphy Dome. These species included: the threatened peregrine falcon (*Falco peregrinus*); three candidate species - North American lynx (*Felis lynx canadensis*), harlequin duck (*Histrionicus histrionicus*), northern goshawk (*Accipiter gentilis*); and four proposed candidate species - gray-cheeked thrush (*Catharus minimus*), Swainson's thrush (*Catharus ustalatus*), blackpoll warbler (*Dendroica striata*), and Wilson's warbler (*Wilsonia pusilla*) (WC 1993).

The Alaska state legislature has designated Creamer's Field as a state refuge to be managed by the Alaska Department Fish and Game Habitat Division (Alaska Department of Fish and Game, 1991). Creamer's Field is located approximately 8 air miles from Murphy Dome, upgradient of any drainage from the Murphy Dome AFS.

The Alaska Department of Fish and Game Atlas (1992) of waters important to the spawning, rearing, or migration of anadromous fishes shows no important streams in the Murphy Dome area. The nearest productive fishing area is the Tanana River, which is over 10 river miles south of the installation.

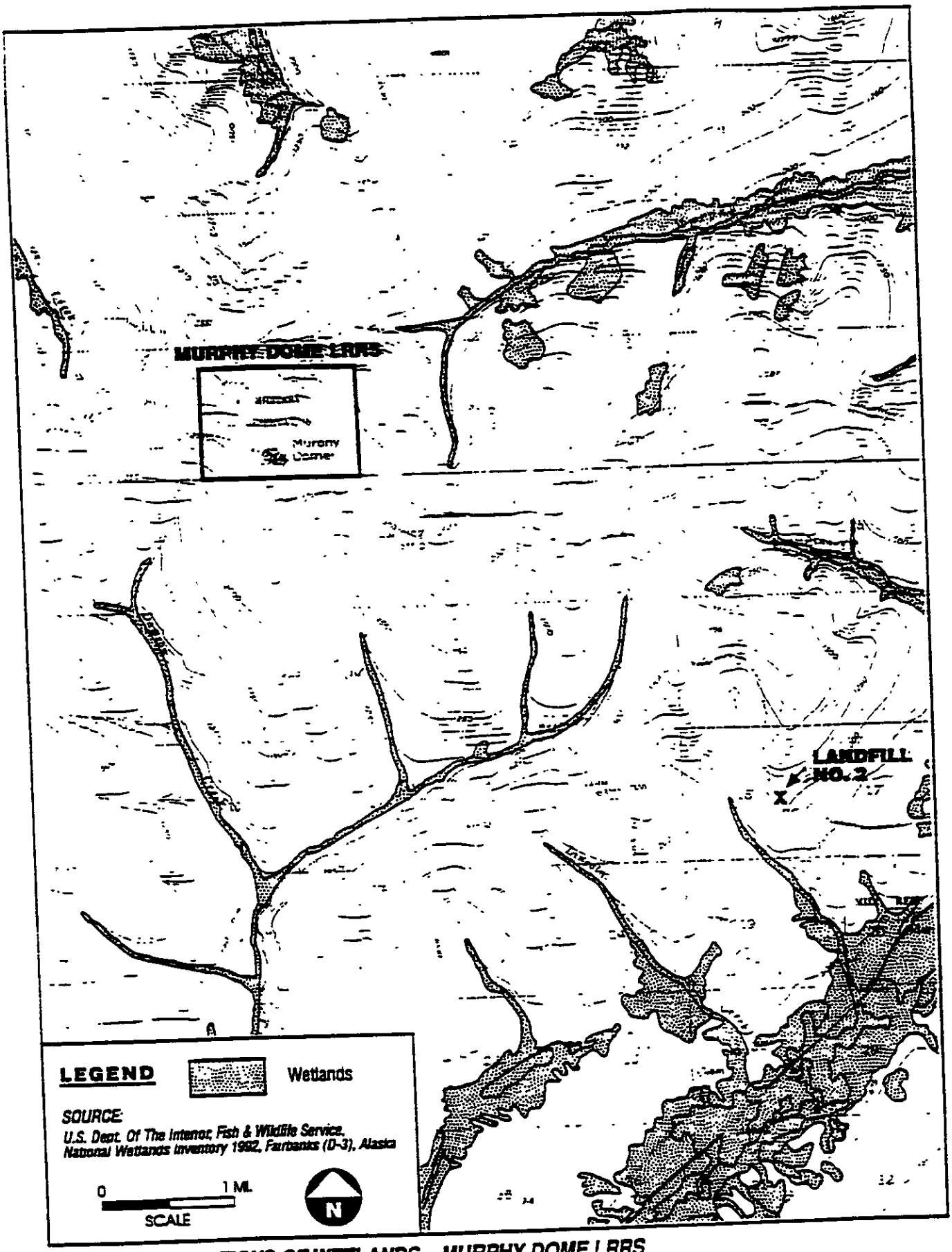

Figure 3.1 LOCATIONS OF WETLANDS – MURPHY DOME LRRS

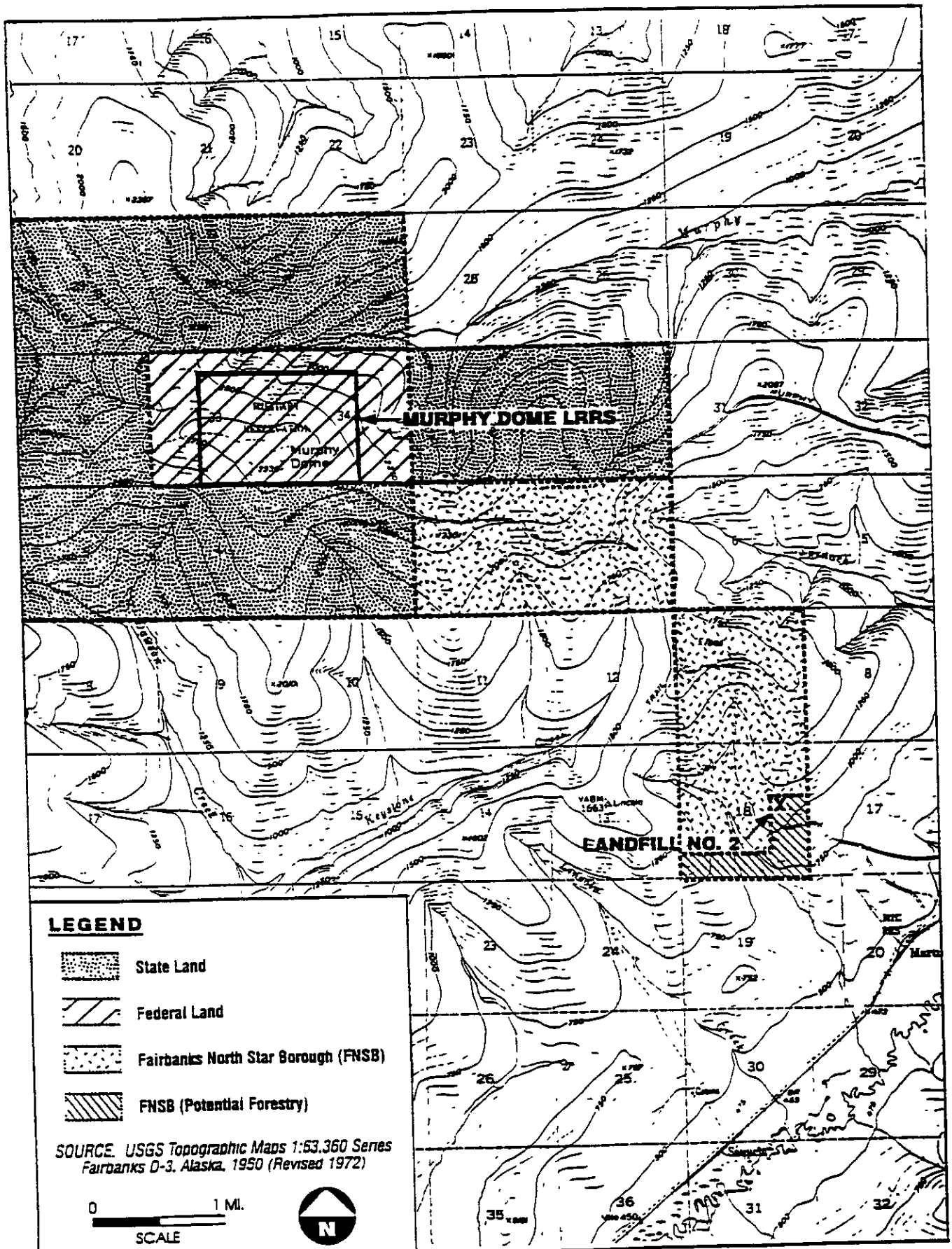

Figure 3.2 LAND OWNERSHIP – MURPHY DOME LRRS

4.0
SUMMARY OF SITE DATA

This section presents a summary of the data collected for each of the three study sites: the White Alice Site, Road Oiling, and Landfill No. 2. The discussion of each site includes a description of the geology and soils, hydrology, analytical data, and an evaluation of the findings. The section concludes with information on background sampling activities from both the 1992 and 1993 field work.

The analytical results for samples collected in 1993 are summarized in Table 4.1. Table 4.2 summarizes the sampling results from the 1992 site investigation. The analytical results for samples collected in 1990 are summarized in Table 4.3. An overall map of the installation and individual study sites can be found in Section 2.0 (Figure 2.3). Individual maps of each site are presented in this section as Figure 4.1 (White Alice Site), Figure 4.2 (Road Oiling area), and Figure 4.3 (Landfill No. 2).

Additional discussions about the field activities and methods used during the 1993 SA were included in the Draft Site Assessment Report (1994). Details relating to previous investigations can be found in the reports listed in Section 2.1 of this document.

4.1 WHITE ALICE SITE (OT06)

4.1.1 Geology and Soils

The seven surficial soil samples collected at the White Alice Site were described as sandy gravel. Site-specific information on permafrost and subsurface geology (deeper than 3 feet) is not available for the White Alice Site. Section 3.3 of this document provides a description of the geology and the soils in the general Murphy Dome area.

WC observed two small (<10 square feet each) stained areas on the south side of the remaining building during the 1990 site visit. Snow cover prevented an inspection for stained soils during the 1992 site visit. No petroleum or other unusual odors were noted during the sampling.

4.1.2 Hydrology

Surface runoff from the White Alice Site drains south, either to Dawson Creek or a tributary of Keystone Creek. Dawson and Keystone Creeks eventually discharge to Cache Creek, and then into Goldstream Creek. Site-specific information on groundwater is not available for the White Alice Site. Sections 3.4 and 3.5 of this document provide descriptions of the surface water hydrology and the hydrogeology, respectively, of the Murphy Dome area.

4.1.3 Analytical Results

In 1990, WC collected a composite soil sample (Sample 857-SO-001-C-001) from the two stained areas adjacent to the southeast side of the building. The sample was analyzed for organochlorine pesticides and PCBs (EPA Method E8080). Neither pesticides nor PCBs were detected.

In 1992, WC collected three surface and three co-located subsurface soil samples near the exterior doors of the building (see Table 4.2). The samples were analyzed for pesticides/PCBs, volatile organics, and semi-volatile organics. The compounds that were detected along with the highest results are listed below.

- PCBs (aroclor 1260) - 340 µg/kg
- 4,4'-DDT - 160 µg/kg
- 4,4'-DDD - 43 µg/kg
- Endrin aldehyde - 11 µg/kg
- Tetrachloroethene - 5 µg/kg
- Ethylbenzene - 0.6 µg/kg
- Toluene - 0.7 µg/kg
- Chloroform 0.1 µg/kg

No samples were collected from the White Alice Site in 1993.

4.1.4 Evaluation of Findings

Nature and Extent of Contamination

Analytical data and field observations indicate that some surficial soils at the White Alice Site contain trace amounts of contaminants. WC observed two small areas of stained soils south of the building; however, no pesticides or PCBs were detected in the composite sample collected from the stained areas in 1990. Analyses of the three soil samples collected from the west and southwest sides of the building in 1992 indicate that low levels of seven organic compounds (see Section 4.1.3 above) are present in the surficial soils in that area.

The extent of contamination is likely confined to the area near the building, which is the only area where visible evidence of contamination was observed.

Contaminant Fate and Transport

Potential pathways for contaminant transport from a release source to receiving media are air, surface water, groundwater, and direct uptake. Air can be a receiving medium through volatilization and fugitive dust generation. Contaminants may reach groundwater by migration through the soil and leaching. Soil may receive contaminants through leaching, surface runoff, episodic overland flow, fugitive dust deposition, and tracking. Surface water may receive contaminants from surface runoff, episodic overland flow, and from groundwater seeps. Sediments may receive contaminants from surface runoff and groundwater seeps. Biota may receive contaminants by uptake from direct contact, ingestion, and inhalation.

The air pathways for this potential source are not significant for several reasons. The only contaminants found at the surface, PCBs, DDT, DDD, and Endrin aldehyde, have low vapor pressures and do not volatilize readily. Additionally, the site is typically snow-covered for about one-half of each year.

Since there are no regional aquifers in the area, groundwater contamination is not a significant issue. Water that does percolate through the site probably surfaces downslope.

The subsurface contaminants (found in trace amounts) have low aqueous solubilities, minimizing the likelihood that significant amounts would migrate off-site.

The probable receiving media to which biota might have access to contaminants associated with this site are surface water and sediment in downgradient drainages. All the surface soil contaminants found previously were at low levels, and have corresponding low mobilities. It is unlikely that significant amounts of these contaminants have migrated off-site.

4.2 ROAD OILING (OT05)

4.2.1 Geology and Soils

In 1993,WC collected three surface soil samples at a depth of about 6 inches along the shoulders of the road. Samples MD-K005-A-024, collected near the White Alice site, and MD-K005-A-026, obtained across from the helipad, consisted of gravelly silt. Sample MD-K005-A-025, which was collected inside of the installation gate, was composed of brown silt. The sampling team did not note petroleum or other unusual odors.

Site-specific information on permafrost and subsurface geology is not available for the Road Oiling area. Section 3.3 of this document provides a description of the geology and the soils in the general Murphy Dome area.

4.2.2 Hydrology

The drainage at each of the sample locations varies in direction. Drainage is to the east at the sample location near the White Alice Site, drainage is to the southwest near the installation gate, and the helipad area is relatively flat. Overall drainage was to the west. In each case, the sample location was chosen to represent downgradient conditions.

Site-specific information on groundwater is not available for the Road Oiling area. Sections 3.4 and 3.5 of this document provide descriptions of the surface water hydrology and the hydrogeology, respectively, of the Murphy Dome area.

4.2.3 Analytical Results

The soil samples collected in 1993 were analyzed for pesticides and PCBs. Table 4.1 provides a summary of analytical results for samples collected at the Road Oiling locations. As shown on the table, the pesticide p,p'-DDT was detected at 0.047 mg/Kg in sample MD-K005-A-026, collected near the helipad. No other pesticides or PCBs were detected above method detection limits in the samples from this site.

4.2.4 Evaluation of Findings

Nature and Extent of Contamination

Although there is historical evidence that waste oils and other shop wastes were applied to roads for dust control and as a method of waste disposal, laboratory results do not confirm contamination at all locations. It is unknown if the pesticides detected in a sample from near the helipad are related to past road oiling or other practices such as weed control. Numerical soil cleanup levels for DDT compounds have not been established by either the USEPA or ADEC.

Contaminant Fate and Transport

Potential pathways for contaminant transport from a release source to receiving media are air, surface water, groundwater, and direct uptake. Air can be a receiving medium through volatization and fugitive dust generation. Contaminants may reach groundwater by migration through the soil and leaching. Soil may receive contaminants through leaching, surface runoff, episodic overland flow, fugitive dust deposition, and tracking. Surface water may receive contaminants from surface runoff, episodic overland flow, and from groundwater seeps. Sediments may receive contaminants from surface runoff and groundwater seeps. Biota may receive contaminants by uptake from direct contact, ingestion, and inhalation.

The air pathways for this potential source are not significant for several reasons. The only contaminant found, DDT, has a low vapor pressure and does not volatize readily. Additionally, the site is typically snow-covered for about one-half of each year.

Since there are no regional aquifers in the area, groundwater contamination is not a significant issue. Water that does percolate through the site probably surfaces downslope. The contaminant DDT has a low aqueous solubility, minimizing the likelihood that significant amounts would migrate off-site.

The probable receiving media to which biota might have access to contaminants associated with this site are surface water and sediment in downgradient drainages. The surface soil contaminant found was at low levels and has a corresponding low mobility. It is unlikely that this contaminant would migrate off-site.

4.3 LANDFILL NO. 2 (LF04)

4.3.1 Geology and Soils

To assess possible off-site contaminant migration, WC drilled three soil borings on the downslope side of Landfill No. 2 during the 1993 investigation. One soil boring (LF2-1) was located about 50 feet from the edge of the landfill and drilled to refusal in bedrock at a depth of 19 feet. Boring LF2-1 encountered gravelly silt in the top 8.5 feet below grade. Schist was observed from 8.5 feet to the bottom of the boring at 19 feet. The upper portion of the schist was decomposed. There was insufficient material at the bedrock interface to collect a sample due to hard driving conditions. Field screening indicated contamination as absent.

The second soil boring (LF2-2) was located about 195 feet downslope of the landfill. Boring LF2-2 encountered gravelly silt to 4.5 feet below grade, and schist from 4.5 feet to 6.5 feet. Auger refusal terminated the boring at 6.5 feet and not enough soil was obtained to collect a sample. Field screening results did not indicate contamination.

The third soil boring (LF2-3) was located about 95 feet downslope. Boring LF2-3 encountered 7.5 feet of gravelly silt overlying the schist. The top 2 feet of the schist were decomposed and weathered, and a grain-size analysis of the material resulted in a soils classification of silty sand with gravel. Two subsurface soil samples, MD-S045-A-001 and MD-S075-A-002, were collected at 4.5 and 7.5 feet, respectively. The soil boring was advanced to a total depth of 10 feet with bedrock located at a depth of 9.5 feet.

The WC team did not observe permafrost, soil staining, or petroleum odors during drilling of the borings.

4.3.2 Hydrology

The regional surface drainage in the area is in a south-southeast direction. The landfill itself is in a bench area and is relatively level. A steep slope is present to the north and south. The field team observed a small area of standing water in the eastern portion of the landfill, but did not observe drainage channels away from the site. Vegetation is absent within the landfill.

None of the borings encountered groundwater.

4.3.3 Analytical Results

Table 4.1 provides a summary of analytical results for the two samples collected at Landfill No. 2 in 1993. The samples were analyzed for TPH, DRO, GRO, BETX, volatile chlorinated solvents, pesticides, PCBs and metals. Organic contaminants and PCBs were not detected above method detection limits in either sample. Metals concentrations ranged from 0.71 to 1.4 mg/Kg for arsenic, 0.99 to 5.2 mg/Kg for chromium, and 35 to 140 mg/Kg for lead.

Sampling in the vicinity of Landfill No. 2 was performed in 1986 (WC 1989). One surface water and one sediment sample were collected and analyzed for petroleum hydrocarbons, purgeable halocarbons, and purgeable aromatic hydrocarbons. Petroleum hydrocarbons were detected at 6.7 mg/Kg. Benzene was found at 2.80 mg/Kg, ethylbenzene at 0.52 mg/Kg, toluene at 0.96 mg/Kg, 1,1-dichloroethene at 0.21 mg/Kg, and 1,2-dichlorobenzene at 0.12 mg/Kg. A duplicate sample showed benzene at 2.70 mg/Kg, ethylbenzene at 1.50 mg/Kg, toluene at 2.80 mg/Kg, 1,1-dichloroethene at 2.00 mg/Kg, and 1,2-dichlorobenzene at 0.12 mg/Kg.

4.3.4 Evaluation of Findings

Nature and Extent of Contamination

In 1993, three soil borings were positioned on the downgradient side of the landfill to evaluate possible subsurface migration of contaminants. The soil boring logs showed shallow bedrock (6.5 to 19 feet depth) and groundwater was absent. Analyses of subsurface soil samples for petroleum hydrocarbons, chlorinated solvents, and metals found only arsenic, chromium, and lead. Arsenic and chromium concentrations were all below the levels of the background soil samples. Soil lead concentrations exceeded background soil levels (10.1 and 10.6 mg/Kg); however, the quantity of samples collected were statistically too few to conclude that the soil was contaminated.

Soil sample results for metals from the 1992 investigation indicated background levels except for possibly lead in the surface soil. There are no numeric regulatory limits for total lead concentrations in soil. Soil lead contamination meeting the definitions of a Toxicity Characteristic (TC) waste, defined by the Resource Conservation and Recovery Act (RCRA), must be treated and disposed of as required by RCRA. To estimate a worst-case soil concentration in terms of total milligrams of lead per kilograms of soil that would not exceed the TC standard for lead, a dilution factor of 20 is used (TC screening value = TC value x 20). The TC-derived screening value for soil lead is 100mg/Kg. The mean soil lead concentration at landfill No. 2 was 88 mg/Kg.

The 1986 sample results indicate that there may have been slight petroleum hydrocarbon contamination at the downgradient side of the landfill. The contaminant concentrations were all below current regulatory action levels.

Contaminant Fate and Transport

Potential pathways for contaminant transport from a release source to receiving media are air, surface water, groundwater, and direct uptake. Air can be a receiving medium through volatilization and fugitive dust generation. Contaminants may reach groundwater by migration through the soil and leaching. Soil may receive contaminants through leaching, surface runoff, episodic flow, fugitive dust deposition, and tracking. Surface water may

receive contaminants from surface runoff, episodic overland flow, and from groundwater seeps. Sediments may receive contaminants from surface runoff and groundwater seeps. Biota may receive contaminants by uptake from direct contact, ingestion, and inhalation.

The air pathways for this potential source are not significant for several reasons. Except for miscellaneous scraps of metal, wood, and plastic scattered on the surface, the debris is covered by soil. Additionally, the size is typically snow-covered for about one-half of each year.

Since there are no regional aquifers in the area, groundwater contamination is not a significant issue. Water that does percolate through the site probably surfaces downslope. The subsurface metal concentrations have low aqueous solubilities, minimizing the likelihood that significant amounts would migrate off-site.

The probable receiving media to which biota might have access to contaminants associated with this site are surface water and sediment in downgradient drainages. The metal concentrations found previously were at low levels, and have low mobilities. Migration of these metals is not a concern.

4.4 BACKGROUND SAMPLES

4.4.1 Sample Descriptions

WC collected background samples during the 1992 field effort and during the 1993 site assessment. In 1992, the sampling team obtained two soil samples, MD-S-040-A-311 and MD-K-005A-312, from a hand-augured boring at depths of 4.0 and 0.5 feet, respectively. The sample location was at a point 100 feet south of Murphy Dome Road, approximately two miles from the entrance to the station. The soil samples were sandy silt. The 1992 sampling team also collected a background sediment sample. The sediment sample was obtained from Goldstream Creek, taken 100 feet upstream from its confluence with Cache Creek. The right bank was sampled at a depth of six inches. The sediment sample was a peaty silt.

In 1993, the sampling team collected one surface water and one sediment sample and analyzed them for TPH, DRO, GRO, arsenic, chromium, cadmium, and lead. The sample location was along the road to the Chatanika River, which forks from Murphy Dome Road approximately 0.5 miles from the entrance to the station. The team collected the samples at a small groundwater seep on the upgradient side of the road nine miles from the fork. The location was approximately 10 feet from the edge of the road. The sediment sample was a silty sand.

4.4.2 Analytical Results

Table 4.1 includes the analytical results for the 1993 background sampling. Table 4.2 includes the 1992 background sampling results. The 1993 sediment sample (MD-E005-A-029) had a DRO concentration of 66 mg/Kg. For all 1992 and 1993 background soil and sediment samples, arsenic ranged from 6.2 to 23.7 mg/Kg, chromium ranged from 14 to 32.4 mg/Kg, and lead ranged from 8.4 to 15 mg/Kg. All other analytical parameters were below the method detection limits.

No constituents were detected above the method detection limits for the surface water sample.

4.4.3 Evaluation of Findings

The 1992 and 1993 background sampling efforts established the approximate natural range of metals and other tested parameters.

Table 4 1 SUMMARY OF 1993 ANALYTICAL RESULTS - MURPHY DOME LRRS

Sample No.	Matrix	Depth (ft)	Total Petroleum Hydrocarbons (mg/L or mg/kg)	Diesel Range Organics (mg/L or mg/Kg)	Gasoline Range Organics (ug/L or mg/Kg)	BETX (ug/L or mg/kg)				Volatile Chlorinated Solvents (ug/L or mg/kg)				
						Benzene	Ethyl-benzene	Toluene	Total Xylenes	1,2-Dichloro-ethane	Methylene Chloride	1,2-Dichloro propane	Trichloro-ethene	Tetrachloro-ethene
Road Oiling														
MD-K005-A-024	SOIL	0.5	--	--	--	--	--	--	--	--	--	--	--	--
MD-K005-A-025	SOIL	0 5	--	--	--	--	--	--	--	--	--	--	--	--
MD K005-A-026	SOIL	0 5	--	--	--	--	--	--	--	--	--	--	--	--
Landfill No 3														
MD-S045-A-001	SOIL	4.5	ND(21)	ND(11)	ND(5)	ND(0 027)	ND(0 027)	ND(0 027)	ND(0 027)	ND(0 011)	ND(0 11)	ND(0 011)	ND(0 011)	ND(0 011)
MD-S075-A-002	SOIL	7.5	ND(21)	NIX(11)	NIX(5)	NIX(0 027)	NIX(0 027)	ND(0 027)	ND(0 027)	ND(0 011)	ND(0.11)	NIX(0 011)	ND(0 011)	ND(0 011)
Background														
MD-J000-A-028	SW	NA	ND(1)	ND(0 25)	ND(100)	--	--	--	--	--	--	--	--	--
MD-J000-B-028	SW	NA	ND(1)	ND(0 25)	NIX(100)	--	--	--	--	--	--	--	--	--
MD-E005-A-029	SED	0.5	ND(30)	66(15.15)	ND(8)	--	--	--	--	--	--	--	--	--
QA/QC Samples														
Trip Blank	WATER	NA	--	--	ND(100)	ND(0 5)	ND(0 5)	ND(0 5)	ND(0 5)	ND(0 2)	2.2(2 0)	ND(0 2)	NIX(0 2)	ND(0 2)
Trip Blank #2	WATER	NA	--	--	ND(100)	ND(0 5)	NIX(0 5)	NIX(0 5)	NIX(0.5)	NIX(0 2)	2.4(2 0)	ND(0 2)	ND(0 2)	ND(0 2)
Trip Blank #3	WATER	NA	--	--	ND(100)	ND(0 5)	ND(0.5)	NIX(0 5)	NIX(0 5)	ND(0 2)	2.3(2.0)	ND(0 2)	ND(0 2)	ND(0 2)
MD-H000-C-011	WATER	NA	ND(1)	ND(0 25)	ND(100)	ND(0 5)	ND(0 5)	NIX(0 5)	0.7(0 5)	ND(0 2)	ND(2)	0 6(0 2)	NIX(0 2)	ND(0 2)
MD-H000-C-003	WATER	NA	NIX(1)	ND(0 25)	NIX(100)	NIX(0 5)	NIX(0.5)	NIX(0 5)	NIX(0 5)	NIX(0 2)	NIX(2 0)	ND(0 2)	ND(0 2)	NIX(0 2)
MD-H000-C-023	WATER	NA	NIX(1)	ND(0 25)	NIX(100)	NIX(0 5)	NIX(0 5)	NIX(0 5)	0 6(0 05)	NIX(0 2)	NIX(0.2)	NIX(0.2)	NIX(0 2)	NIX(0 2)

4-11

( ) - detection limit
ND - not detected
SED - sediment
SW - surface water
(--) not tested
a - Data qualified, analyte detected in decontamination blank

(MD2.XLS) 12/6/94

Table 4.1 SUMMARY OF 1993 ANALYTICAL RESULTS - MURPHY DOME LRRS

Sample No.	Matrix	Depth (ft)	Organochlorine Pesticides (ug/L or mg/kg)									PCBs (ug/L or mg/kg)
			Alpha-BHC	Beta-BHC	Lindane (Gamma-BHC)	Delta-BHC	p,p'-DDD	p,p'-DDT	Endrin	Heptachlor	Aldrin	
Road Oiling												
MD-K005-A-024	SOIL	0 5	ND(0 0057)	ND(0 0057)	ND(0 0057)	ND(0 0057)	ND(0 011)	ND(0 011)	ND(0 011)	ND(0 0057)	ND(0 0057)	ND(0 11)
MD-K005-A-025	SOIL	0 5	ND(0 0059)	ND(0 0059)	ND(0 0059)	ND(0 0059)	ND(0 012)	ND(0 012)	ND(0 012)	ND(0 0059)	ND(0 0059)	ND(0 12)
MD-K005-A-026	SOIL	0 5	ND(0 0060)	ND(0 0060)	ND(0 0060)	ND(0 0060)	ND(0 012)	0 047(0 012)	ND(0 012)	ND(0 0060)	ND(0 0060)	ND(0 12)
Landfill No 2												
MD-S045-A-001	SOIL	4 5	ND(0 0054)	ND(0 0054)	ND(0 0054)	ND(0 0054)	ND(0 11)	ND(0 11)	ND(0 11)	ND(0 0054)	ND(0 0054)	ND(0.11)
MD-S075-A-002	SOIL	7 5	ND(0 0054)	ND(0 0054)	ND(0 0054)	ND(0 0054)	ND(0 11)	ND(0.11)	ND(0 11)	ND(0 0054)	ND(0 0054)	ND(0 11)
Background												
MD-J000-A-028	SW	NA	--	--	--	--	--	--	--	--	--	--
MD-J000-B-028	SW	NA	--	--	--	--	--	--	--	--	--	--
MD-E005-A-029	SED	0.5	--	--	--	--	--	--	--	--	--	--
QA/QC Samples												
Trip Blank	WATER	NA	--	--	--	--	--	--	--	--	--	--
Trip Blank #2	WATER	NA	--	--	--	--	--	--	--	--	--	--
Trip Blank #3	WATER	NA	--	--	--	--	--	--	--	--	--	--
MD-H000-C-011	WATER	NA	ND(0 048)	ND(0 048)	ND(0 048)	ND(0 048)	ND(0 097)	ND(0 097)	ND(0 097)	ND(0 048)	ND(0 048)	ND(0 97)
MD-H000-C-003	WATER	NA	ND(0 060)	ND(0 060)	ND(0 060)	ND(0 060)	ND(0 12)	ND(0.12)	ND(0 12)	ND(0 060)	ND(0 060)	ND(1.2)
MD-H000-C-023	WATER	NA	ND(0 049)	ND(0 049)	ND(0 049)	ND(0 049)	ND(0 098)	ND(0 098)	ND(0.098)	ND(0.049)	ND(0 049)	ND(0 98)

( ) - detection limit
ND - not detected
SED - sediment
SW - surface water
(--) not tested
a - Data qualified, analyte detected in decontamination blank

Table 4 1 SUMMARY OF 1993 ANALYTICAL RESULTS - MURPHY DOME LRRS

Sample No.	Matrix	Depth (ft)	Metals (mg/L or mg/kg) Arsenic	Chromium	Cadmium	Lead
Road Oiling						
MD-K005-A-024	SOIL	0 5	--	--	--	--
MD-K005-A-025	SOIL	0.5	--	--	--	--
MD-K005-A-026	SOIL	0.5	--	--	--	--
Landfill No 2						
MD-S045-A-001	SOIL	4 5	0.71(0 27)	5.2(0.54)	ND(0 28)	35(0 16)
MD-S075-A-002	SOIL	7.5	1.4(0.27)	0.99(0.54)	ND(0.26)	140(0.16)
Background						
MD-J000-A-028	SW	NA	ND(0 0050)	ND(0 010)	ND(0 0050)	ND(0 0030)
MD-J000-B-028	SW	NA	ND(0 0050)	ND(0.010)	ND(0 0050)	ND(0 0030)
MD-E005-A-029	SED	0.5	6.2(0.38)	14(0.76)	ND(0 37)	15(0 23)
QA/QC Samples						
Trip Blank	WATER	NA	--	--	--	--
Trip Blank #2	WATER	NA	--	--	--	--
Trip Blank #3	WATER	NA	--	--	--	--
MD-H000-C-011	WATER	NA	ND(0 0050)	ND(0.010)	ND(0.0050)	ND(0 0030)
MD-H000-C-003	WATER	NA	ND(0 0050)	ND(0 010)	ND(0 0050)	ND(0 0030)
MD-H000-C-023	WATER	NA	ND(0.0050)	ND(0.010)	ND(0 0050)	ND(0.0030)

( ) - detection limit
ND - not detected
SED - sediment
SW - surface water
(--) not tested
a - Data qualified, analyte detected in decontamination blank

TABLE 4.2 SUMMARY OF 1992 ANALYTICAL RESULTS: MURPHY DOME LRRS DETECTED ORGANICS IN SOIL

Sample #	Matrix	Depth (feet)	PESTICIDES/PCBs	Result (ug/kg)	Qual. (a)	VOLATILES	Result (ug/kg)	Qual. (a)	SEMIVOLATILES	Result (ug/kg)	Qual. (a)
Source 7: White Alice											
MD-S-020-A-101	Soil Boring	2.0	4,4'-DDD	9	J	tetrachloroethene	0.7	J	none detected		
			4,4'-DDT	10	J	toluene	0.5	J			
MD-K-005-A-102	Surface Soil	0.5	4,4'-DDD	43	J	none detected			none detected		
			4,4'-DDT	160	J						
			aroclor 1260	170	J						
MD-S-025-A-103	Soil Boring	2.5	4,4'-DDD	4.9	J	tetrachloroethene	5	J	none detected		
			4,4'-DDT	24	J	toluene	0.6	J			
MD-S-025-B-103	Soil Boring	2.5	4,4'-DDD	4.1	J	tetrachloroethene	2	J	none detected		
			4,4'-DDT	18	J	toluene	0.4	J			
MD-K-005-A-104	Surface Soil	0.5	4,4'-DDT	4.3	J	none detected			none detected		
			aroclor 1260	33	J						
MD-K-005-B-104	Surface Soil	0.5	4,4'-DDT	8.6	J	chloroform	0.1	J	none detected		
			aroclor 1260	64							
MD-S-030-A-105	Soil Boring	3.0	4,4'-DDD	12		tetrachloroethene	1	J	none detected		
			4,4'-DDT	23	J	toluene	0.7	J			
						ethylbenzene	0.6	J			
MD-K-005-A-106	Surface Soil	0.5	4,4'-DDD	11	J	none detected			none detected		
			4,4'-DDT	65	J						
			endrin aldehyde	11	J						
			aroclor 1260	340	J						
Background - Soil											
MD-S-040-A-311	Soil Boring	4.0	none detected			volatiles not analyzed for this sample			semivolatiles not analyzed for this sample		
MD-K-005-A-312	Surface Soil	0.5	none detected			volatiles not analyzed for this sample			semivolatiles not analyzed for this sample		
Background - Sediment											
MD-E-005-A-308	Sediment	0.5	none detected			volatiles not analyzed for this sample			semivolatiles not analyzed for this sample		

(a) The qualifier 'J' indicates that the result is an estimate. 'None detected' indicates that no target analytes were detected.

TABLE 4.2 SUMMARY OF 1992 ANALYTICAL RESULTS: MURPHY DOME LRRS
DETECTED ORGANICS IN WATER

Sample #	Matrix	PESTICIDES/PCBs	Result (ug/L)	Qual. (a)	VOLATILES	Result (ug/L)	Qual. (a)	SEMIVOLATILES	Result (ug/L)	Qual (a)
MD-N-000-C-310 (rinsate)	reagent water	data not received			chloroform	1	J	none detected		
TRIP BLANK-1	reagent water	sample not analyzed for pesticides/PCBs			none detected	1	J	sample not analyzed for semi-volatiles		
TRIP BLANK-2	reagent water	sample not analyzed for pesticides/PCBs			none detected	1	J	sample not analyzed for semi-volatiles		

(a) Note: The qualifier 'J' indicates that the result is an estimate 'None detected' indicates that no target analytes were detected.

TABLE 4.2 SUMMARY OF 1992 ANALYTICAL RESULTS: MURPHY DOME LRRS
METALS IN SOIL [All Results in mg/kg]

Sample #	Matrix	Depth (feet)	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium		Calcium		Chromium	
			Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif
Source 7: White Alice																		
no metals analyses performed for this source																		
Background - Soil																		
MD-S-040-A-311	Soil Boring	4 0	18100		4 1	U	10 8		271		0 74	J	0 49	U	3750		32 4	
MD-K-005-A-312	Surface Soil	0 5	18200		4 9	U	10		114		0 51	J	0.58	U	1680		29 3	
Background - Sediment																		
MD-E-005-A-308	Sediment	0 5	13400		10 6	J	23 7		134		0 55	J	0 65	U	3530		25.7	

NOTES: The qualifier 'J' indicates that the result is an estimate. The qualifier 'U' indicates that the parameter was not detected; the value shown as the result is the reporting limit

TABLE 4.2 SUMMARY OF 1992 ANALYTICAL RESULTS: MURPHY DOME LRRS
METALS IN SOIL, continued [All Results in mg/kg]

Sample #	Matrix	Depth (feet)	Cobalt Result	Cobalt Qualif	Copper Result	Copper Qualif	Iron Result	Iron Qualif	Lead Result	Lead Qualif	Magnesium Result	Magnesium Qualif	Manganese Result	Manganese Qualif	Mercury Result	Mercury Qualif	Nickel Result	Nickel Qualif
Source 7: White Alice no metals analyses performed for this source																		
Background - Soil																		
MD-S-040-A-311	Soil Boring	4 0	10 5	J	33 2		31000		10 1		6170		513		0 11	U	34 3	
MD-K-005-A-312	Surface Soil	0 5	6 4	J	17 7		29200		10 6		4230		203		0 13	U	22 5	
Background - Sediment																		
MD-E-005-A-308	Sediment	0 5	9 3	J	19 3		24300		8 4		5610		352		0 15	U	29 4	

NOTES: The qualifier 'J' indicates that the result is an estimate The qualifier 'U' indicates that the parameter was not detected, the value shown as the result is the reporting limit.

TABLE 4.2 SUMMARY OF 1992 ANALYTICAL RESULTS: MURPHY DOME LRRS
METALS IN SOIL, concluded (All Results in mg/kg)

Sample #	Matrix	Depth (feet)	Potassium		Selenium		Silver		Sodium		Thallium		Vanadium		Zinc	
			Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif
Source 7: White Alice																
no metals analyses performed for this source																
Background - Soil																
MD-S-040-A-311	Soil Boring	4 0	806	J	0 49	U	1 2	U	561	J	0 49	U	60 2		66 2	
MD-K-005-A-312	Surface Soil	0 5	594	J	0 58	U	1 5	U	562	J	0 58	U	66 7		50 4	
Background - Sediment																
MD-E-005-A-308	Sediment	0 5	933	J	0.73	U	1.6	U	729	J	0 73	U	45 6		66 3	

NOTES: The qualifier 'J' indicates that the result is an estimate. The qualifier 'U' indicates that the parameter was not detected; the value shown as the result is the reporting limit.

TABLE 4.2 SUMMARY OF 1992 ANALYTICAL RESULTS: MURPHY DOME LRRS
METALS IN WATER [ug/l]

Sample ID	Matrix	Aluminum		Antimony		Arsenic		Barium		Beryllium		Cadmium	
		Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif
MD-N000-C310	reagent water	18	U	17	U	2	U	17	U	1	U	2	U

Sample ID	Matrix	Calcium		Chromium		Cobalt		Copper		Iron		Lead	
		Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif
MD-N000-C310	reagent water	149	U	5	U	4	U	3.9	J	25.3	U	1	U

Sample ID	Matrix	Magnesium		Manganese		Mercury		Nickel		Potassium		Selenium	
		Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif
MD-N000-C310	reagent water	249	U	1	J	0 2	U	11	U	776	U	2	U

Sample ID	Matrix	Silver		Sodium		Thallium		Vanadium		Zinc	
		Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif	Result	Qualif
MD-N000 C310	reagent water	5	U	584	U	2	U	3	U	10 5	U

(a) The qualifier "J" indicates that the result is an estimate. The qualifier "U" indicates that the parameter was not detected, the value shown as the result is the reporting limit.

TABLE 4.3 - 1990 White Alice Sample Data, Murphy Dome LRRS

SAMPLE ID	SAMPLE LOCATION	SAMPLE DEPTH (FT)	SOIL TYPE	ANALYTICAL RESULTS (mg/kg) E8080		COMMENTS
				ORGANO-CHLORINE PESTICIDES	PCB	
857-SO-001-C-001	White Alice Building - south side	0.8	sandy-gravel, damp	ND	ND	composite sample

Definition

ND - Not Detected

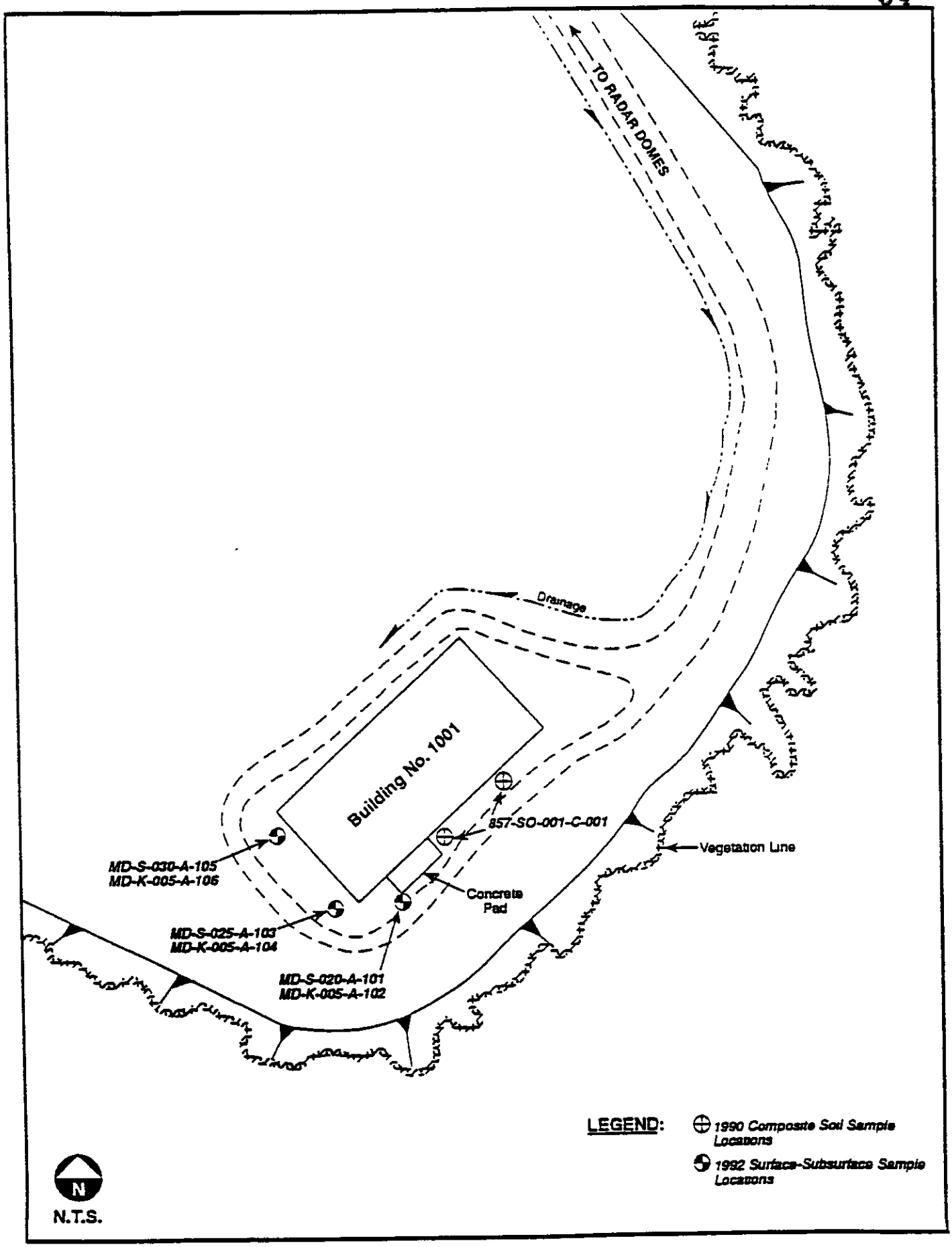

Figure 4.1 WHITE ALICE (OT06) SAMPLING LOCATIONS - MURPHY DOME LRRS

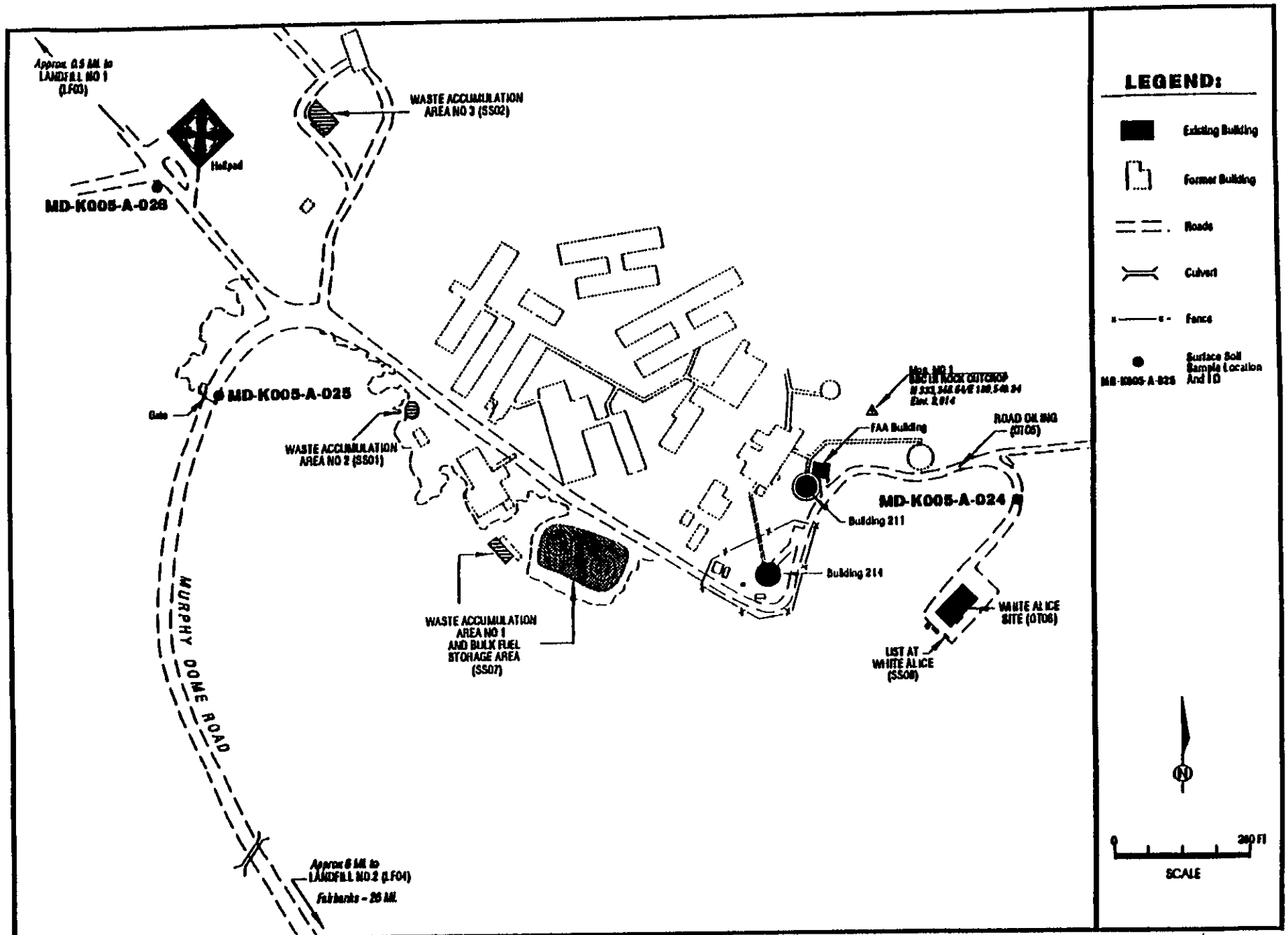

Figure 4.2 ROAD OILING (OT05) SAMPLING LOCATIONS – MURPHY DOME LRRS

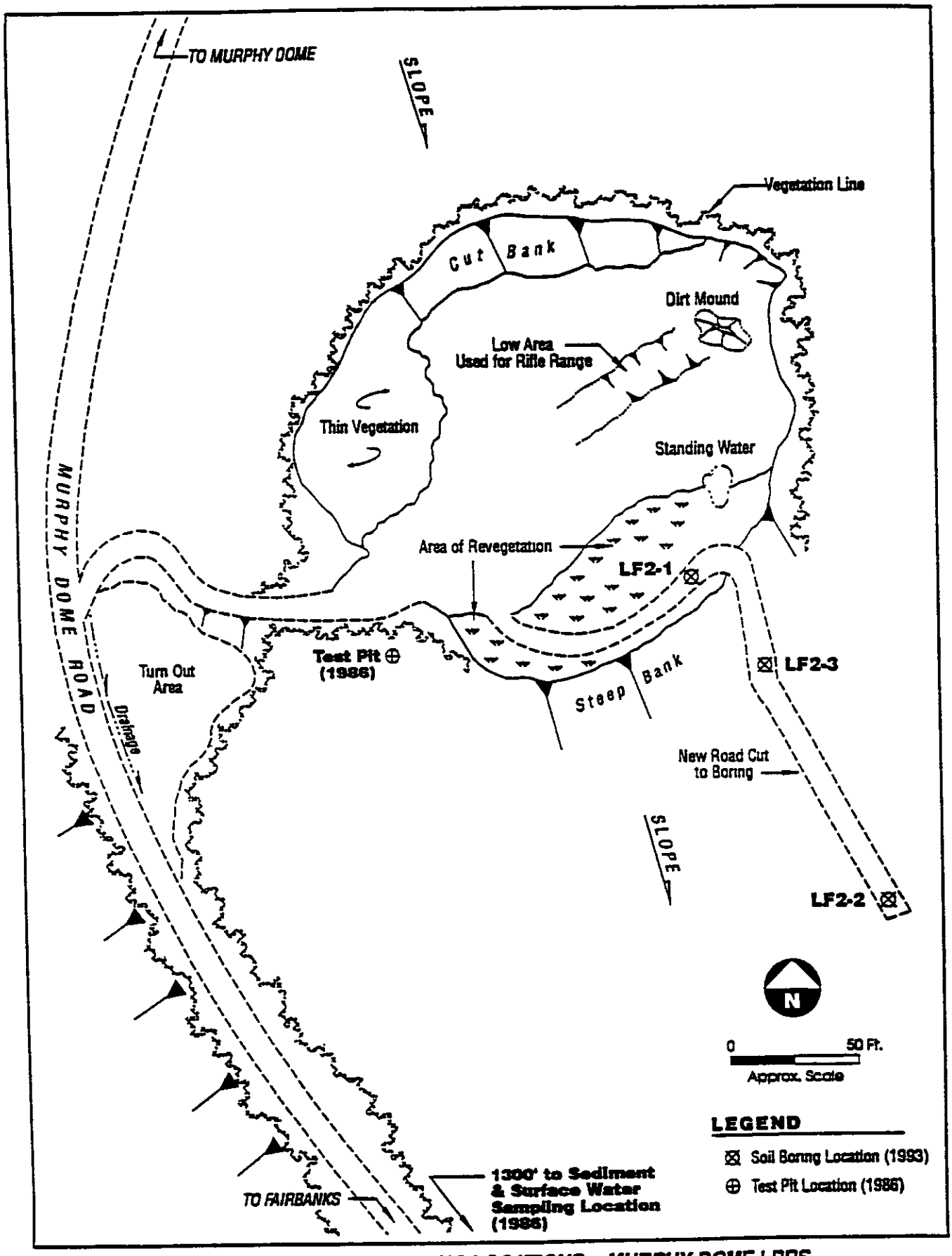

Figure 4.3 LANDFILL NO.2 (LF04) SAMPLING LOCATIONS – MURPHY DOME LRRS

5.0
EXPOSURE ROUTES

This section is a summary of possible exposure routes through air, surface water, groundwater and soil. Additional information related to exposure routes can be found in the Human Health Risk Assessment and the Ecological Risk Assessment; Sections 5.0 and 6.0, respectively, of the Draft Site Assessment Report (WC 1994).

Information concerning waste sources, waste constituent release and transport mechanisms, and locations of potentially exposed individuals (receptors) is used to develop a conceptual understanding of the facility in terms of potential human exposure pathways. The conceptual site model (CSM) is a schematic representation of the contaminant source areas, chemical release mechanisms, environmental transport media, potential human intake routes, and potential human receptors. The CSM for Murphy Dome is shown in Figure 5.1. The purpose of the CSM is to provide a framework for problem definition, to identify exposure pathways that may result in human health risks, to aid in identifying data needed to evaluate those pathways, and to aid in identifying effective cleanup measures, if necessary, that are targeted at significant contaminant sources and exposure pathways.

An exposure pathway includes five necessary elements:

- A source of chemicals
- A mechanism of chemical release
- An environmental transport medium (air, surface water, etc.)
- An exposure point where humans are exposed currently or in the future
- A human intake route (inhalation, ingestion, etc.)

Each one of these five elements must be present for an exposure pathway to be complete. An incomplete pathway means that no human or ecological exposure can occur and there is no risk associated with that pathway. Exposure pathways are considered potentially complete if there are chemical release and transport mechanisms and identified exposure points and

receptors for that exposure pathway. In Figure 5.1, potentially complete exposure pathways are indicated with solid lines and circles; incomplete or insignificant pathways are indicated with broken lines.

5.1 AIR

Inhalation is considered an insignificant intake route because the climate and soil conditions are not conducive to wind erosion. The concentrations of potentially hazardous compounds detected in soil were so low that ambient air concentrations would be insignificant. In addition, most of the constituents that were detected in the soils have low vapor pressures and therefore would not readily volatilize.

5.2 SURFACE WATER AND SEDIMENT

Contaminants in surface soil can be transported in surface runoff to surface water and sediments. Surface water flows intermittently from the dome in all directions; however, there appears to be no significant discharge to permanent surface water features. The nearest perennial stream is approximately one-quarter mile to the east of the station. Therefore, surface water appears to be an insignificant transport pathway from the dome to off-site receptors. Exposure to sediments and surface water in drainage channels or at groundwater seeps is not likely to occur except on a very occasional basis.

5.3 GROUNDWATER

Contaminants from waste sources may percolate or leach to subsurface soils and thence to groundwater. Currently, groundwater is not used as a drinking water source and there are no known aquifers above bedrock that could be used in the future. Therefore, groundwater is not a potential human exposure pathway.

5.4 SOIL

The primary pathway by which humans could be exposed to contaminants at the facility is direct contact with contaminated surface and near-surface soils. Humans that could be exposed include the contract employees manning the facility and visitors recreating in the

area (e.g., hunters and hikers). Facility employees work almost entirely indoors and will not routinely come in contact with contaminated soils. Visitors to the dome tend to stay away from the area near the radar buildings, including the vicinity of the White Alice and Roadway Oiling sites. Landfill No. 2 is visited at least occasionally by target shooters, as evidenced by hundreds of spent shell casings on the ground and shot-up targets.

Direct human contact with subsurface soil is considered an incomplete pathway because such contact would not occur during normal work or recreation activities at the facility. Future land use at the facility is likely to be very similar to current use: a minimally manned radar site and an access point for recreation. Therefore, current and future receptors to this pathway are occupational workers and visitors who may have intermittent contact with contaminated soils.

The greatest exposure potential from direct contact with soils is through incidental ingestion. Dermal exposure to soil will be minimal due to long periods of snow cover and climatic conditions that entail clothing covering most of the body. Therefore, dermal absorption of chemicals from soil is considered insignificant compared to ingestion. Direct contact with subsurface soils (more than two feet deep) is also considered an insignificant or incomplete ecological pathway because of the limited use of deeper soils by wildlife.

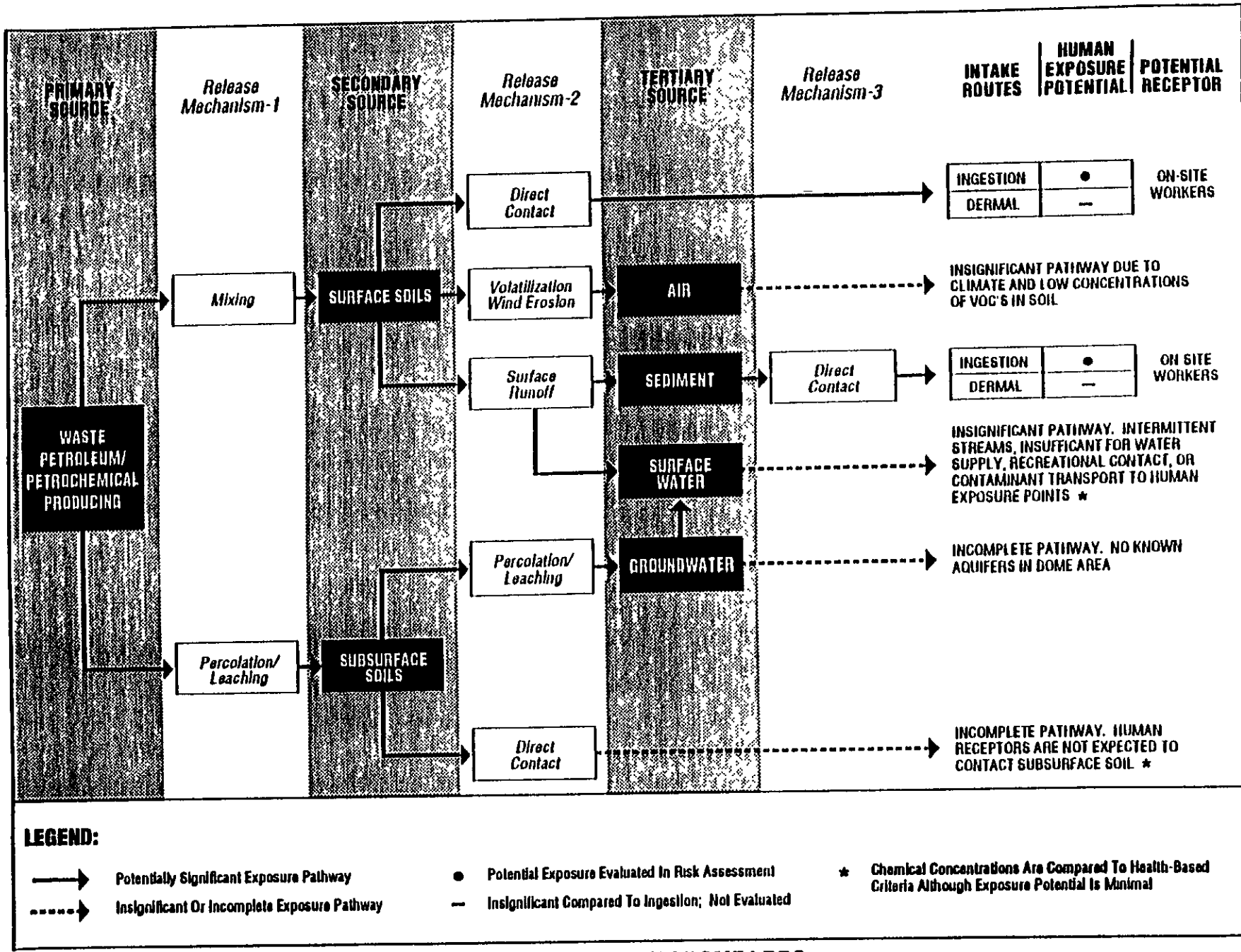

Figure 5.1 HUMAN HEALTH CONCEPTUAL SITE MODEL – MURPHY DOME LRRS

6.0
RECEPTORS

This section is a summary of the potential receptors in the Murphy Dome area, including humans, animals, aquatic organisms, plants, and secondary receptors. Additional information related to receptors can be found in the Human Health Risk Assessment and the Ecological Risk Assessment, Sections 5.0 and 6.0, respectively, of the Draft Site Assessment Report (WC 1994).

An Ecological Conceptual Site Model (ECSM) of the site provides a schematic representation of exposure pathways from chemical sources to potential receptors within each area. Prior to developing an ECSM for the Murphy Dome site, a terrestrial food web model of the site was developed (Figure 6.1). This figure provides a representation of the movement of energy from the primary producers (plants) that transform solar energy into carbohydrates up through the various consumer levels. Information from this food web was used to identify key receptors.

An ECSM is shown in Figure 6.2 and is applicable to all of the waste sources. Spilled contaminants may either directly or indirectly affect soils on site. Soils may be contaminated by products spilled directly onto the ground, or soils downgradient may become contaminated by the movement of surface or groundwater. In either case, soils are considered most likely to serve as a contaminant source for Murphy Dome. The term "soils" includes those samples designated in the site assessment report as sediments, which are actually wet soils collected in downgradient areas. These are not sediments associated with aquatic environments such as creeks or lakes. In the ECSM, the exposure pathways shown are direct contact, direct and incidental ingestion by primary receptors, and indirect exposure (indirect ingestion) to secondary receptors through ingestion of primary receptors.

6.1 HUMAN

As discussed in Section 3.6 of this document, the Murphy Dome facility is a minimally manned long range radar station. No personnel currently reside at the station or within 5 miles of the station. Current personnel (one to two people) work at the radar domes and are

not expected to come into contact with the contaminated areas on a regular basis. It is unlikely that anyone will reside at or near the station in the future.

The nearest population center is the city of Fairbanks (population 75,000), 20 miles southeast of the station; therefore, off-site residents will not be affected by site-related contaminants. There are no schools or day care facilities within 500 feet of Murphy Dome. Outdoor recreation at Murphy Dome LRRS consists of local residents involved in such activities as hiking, bird watching, and ATV riding. The potential for current or future human exposure to contaminated media by contact or ingestion routes at Murphy Dome is minimal.

Portions of the upper Tanana River are within 15 miles of the installation. Sport fishing is practiced for king salmon, chum salmon, arctic grayling, whitefish, and burbot. No commercial fisheries exist on the upper Tanana River. The subsistence fisheries for burbot and whitefish are in excess of 50 pounds per acre of harvested fish. The human food chain production is approximately 1,000 to 10,000 pounds per year.

6.2 ANIMAL

Key receptor species were selected based on the site characterization and ecological conceptual site model. Receptor species are considered to be the same for the entire Murphy Dome area because the environment is similar for all sites. According to the Alaska Natural Heritage Program (1993), there are no known sensitive, threatened, or endangered species occupying the Murphy Dome area. Therefore, selection of key receptors was based upon the known occurrence of a species at the site, and their importance as key components of the Murphy Dome ecosystem.

Small burrowing mammals such as ground squirrels, lemmings, and voles are considered key receptors. They may come into direct contact with contaminated soil, or ingest surface water coming from the groundwater seep. Ground squirrels were chosen as a representative species for this category because they are known to occur in the Murphy Dome area. Their habitat preference is well-drained slopes in association with willow and alder vegetation, or bare soils surrounded by early stage vegetation. The size of their home range averages about five to six acres (Murie & Michener 1984). The average weight of ground squirrels is 1 to 1-1/2 lbs. They feed primarily on legumes, grass, and other herbaceous vegetation that may

be abundant for a short portion of the year but cannot be stored. Ground squirrels, in turn, provide an important food source for carnivorous mammals and predatory birds, although neither is believed to be common in the area. Ground squirrels hibernate for seven to eight months per year in burrows, making them vulnerable to prolonged contact with contaminated soils.

The willow ptarmigan is considered a key receptor because they have been observed at the site, are known to commonly occur in the area, and are an important game species. Willow ptarmigan habitat requirements include tall shrubs scattered in areas dominated by grasses, sedges, mosses, and low herbs (ADF&G 1978). Adult ptarmigan average 18 to 25 oz (Teres 1991). The buds, leaves, twigs, and catkins of willow plants make up four-fifths of their diet, but during summer months they may also take berries, invertebrates, and the flowers and shoots of other herbaceous plants (Weeden 1965). Thus, their exposure to incidental ingestion of contaminated soils is limited to summer months when the ground cover is free of snow. The ptarmigan's breeding habitats are in wetter environments found along stream courses and in riparian shrub communities, generally between 2,000 and 2,800 feet (Weeden 1965).

Herbivorous mammals such as moose and caribou are considered key receptor species due to their feeding habits. Caribou may occasionally pass through the area, feeding on mosses and lichens. Moose, in turn, may browse the area for willows. However, neither species is known to inhabit the Murphy Dome area on a frequent basis, and their exposure frequency and use of the area is believed to be low. Neither tracks nor sign (scat) were observed during the WC site visit (WC 1993). Therefore, although these mammals may briefly occur in the Murphy Dome area, exposure to contaminants is expected to be minimal.

Small carnivorous mammals such as weasels, shrews, and marten may occur in the area, although they have not been reported to be common or abundant. These species prey on smaller mammals that are easy to catch, particularly those that make clear runways and burrows leading straight to their nests, and may also take birds and insects when readily available. Studies of the home range of short-tailed weasels in alpine environments showed that male weasels may use 20-100 acres for their home range (King 1990). Given that the home range of these animals is large in comparison to ground squirrels, their occurrence in the Murphy Dome area is probably sporadic, and exposure to the limited areas of

contamination is considered not significant enough to warrant consideration as a key receptor.

Large mammals such as fox, wolves, and black and brown bears may take ground squirrels and weasels for food. Although they are known to inhabit interior Alaska, they have not been reported to frequent the Murphy Dome area. Also, the aerial extent of the contamination represents a relatively minor component in the overall range of these larger mammals. The exposure frequency and area use by these larger mammals is probably low, and they therefore are not considered key receptor species for Murphy Dome.

Although raptors are known predators on small mammals, they are not included as key receptors because they have not been reported to frequent the area and there are no known nesting or breeding areas within the Murphy Dome vicinity. Although raptors such as peregrine falcons, eagles, and hawks are known to occur in interior Alaska, the lack of specific data confirming their occurrence on Murphy Dome excludes predatory birds from the key receptor list.

6.3 AQUATIC ORGANISMS

The presence of surface water is intermittent in the local area. The nearest perennial stream is approximately one-quarter mile to the east of the station. As discussed in Section 6.1 above, portions of the Tanana River sport and subsistence fisheries are approximately 15 miles from the facility. No commercial fisheries exist in the area. Fish species found in the minor streams in the area include Arctic grayling, whitefish, northern pike, and longnosed sucker.

6.4 PLANTS

Section 3.7 of this document lists the plant species occurring in the Murphy Dome area. None of the species have been listed as endangered or threatened.

6.5 SECONDARY RECEPTORS

Figure 6.2, the ECSM, shows secondary receptors under "Indirect Ingestion". Secondary receptors are those animals that ingest primary receptors. For the Murphy Dome area, secondary receptors include small birds and omnivorous mammals.

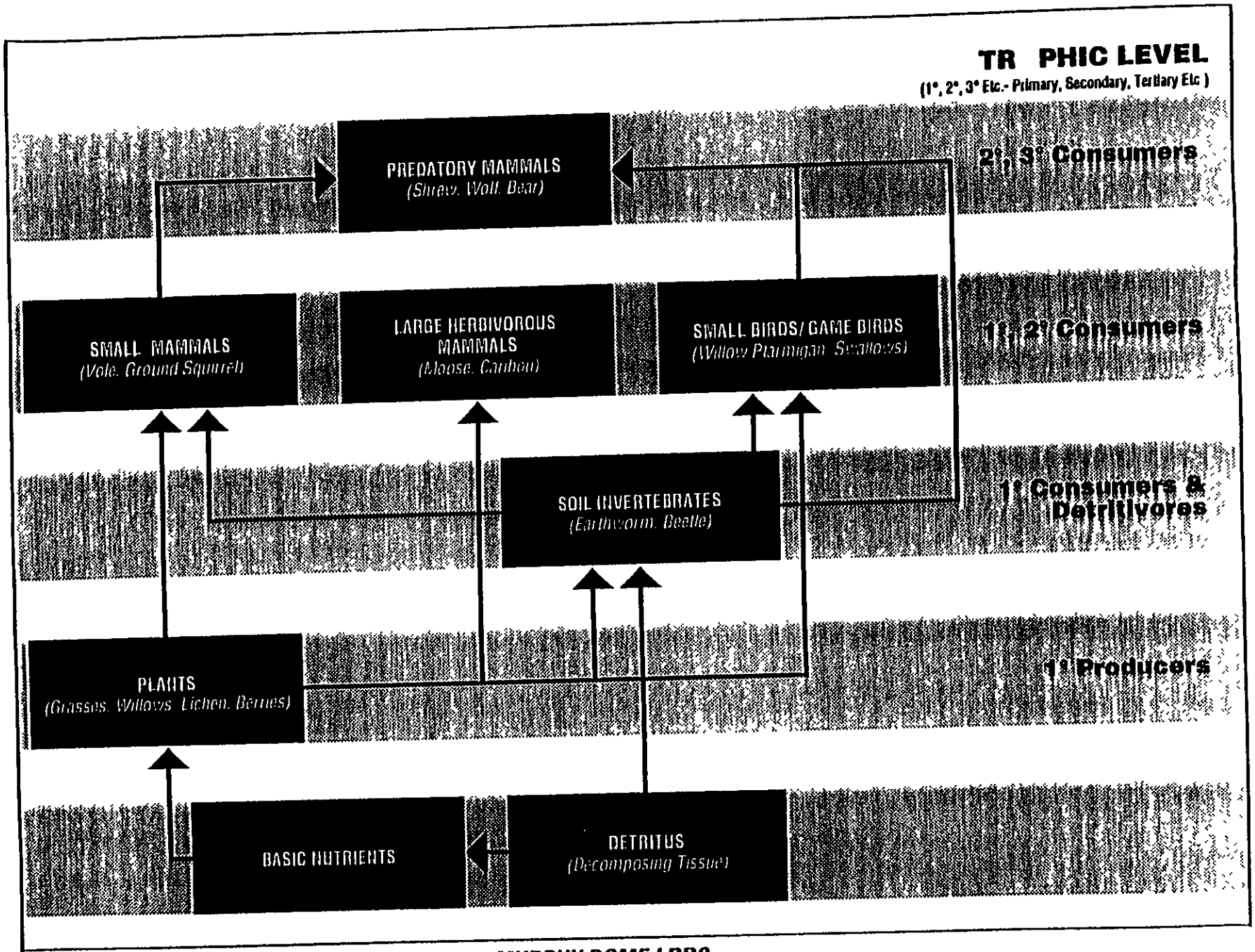

Figure 6.1 TERRESTRIAL (SOILS) FOOD WEB – MURPHY DOME LRRS

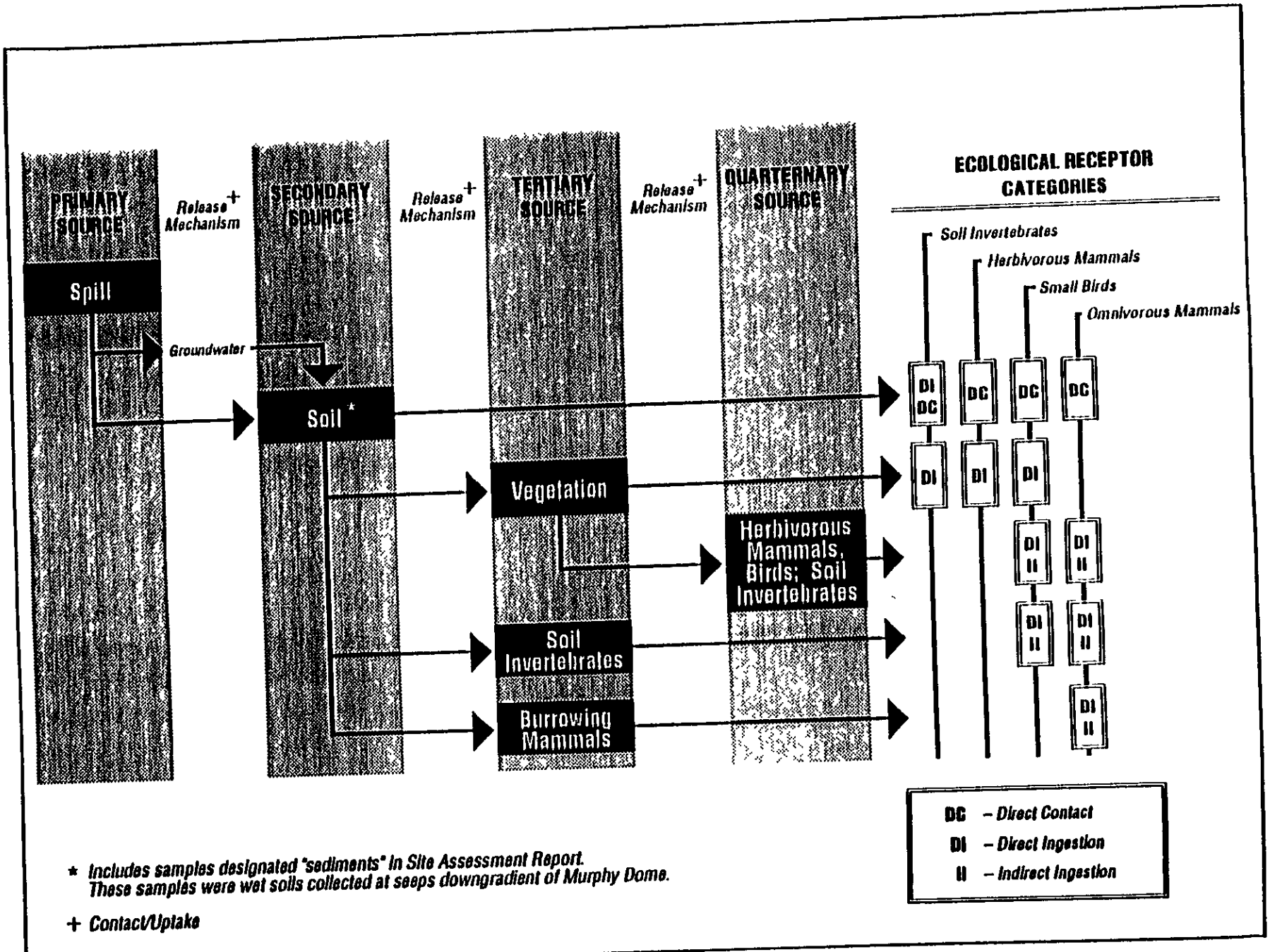

Figure 6.2 ECOLOGICAL CONCEPTUAL SITE MODEL (TERRESTRIAL) – MURPHY DOME LRRS

7.0
TOXICITY

This section is a summary of the toxicity characteristics of the chemicals of concern at the Murphy Dome area. Additional details and the methods employed in determining toxicity characteristics can be found in Sections 5.0 and 6.0, the Human Health Risk Assessment and the Ecological Risk Assessment, respectively, of the Draft SA Report (WC 1994).

Chemicals of Concern (COCs) are site-related elements or compounds that may pose a risk to receptors if an exposure pathway is complete. The COC selection process involves evaluating the concentration of each detected analyte against screening criteria appropriate for each environmental matrix. This distinguishes the presence of chemicals at background or "acceptable" levels from chemicals that are present at abnormally high concentrations.

Table 7.1 shows the chemicals retained as COCs in the surface soils (including wet soils or "sediments") at the White Alice Site, the Road Oiling Area and Landfill No. 2. The compounds detected were compared against background levels to determine their inclusion on the COC list. For contaminants with no background values, any contaminants detected were included as COCs.

7.1 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to evaluate the toxicity of site-related chemicals of concern and provide an estimate of the relationship between extent of exposure and extent of toxic injury (dose-response relationship) for each chemical.

USEPA has performed toxicity assessments for hundreds of potentially hazardous compounds associated with chemical releases from industrial sites. The assessments are based on qualitative and quantitative toxicity information acquired through evaluation of relevant scientific literature. Relevant data regarding human toxicity comes from epidemiologic studies in humans, when available. However, most of the usable information on the toxic effects of chemicals comes from controlled experiments in animals. The result of toxicity assessments performed by USEPA is the development of chemical-specific toxicity factors

for either the inhalation or oral exposure pathway. These toxicity factors are published in the Integrated Risk Information System (IRIS; USEPA 1994) and the Health Effects Assessment Summary Tables (HEAST; USEPA 1993). IRIS is an USEPA database containing health risk and regulatory information for numerous chemicals. Only toxicity factors that have been verified by USEPA science work groups are included in IRIS. HEAST contains interim and subchronic toxicity factors that do not appear in IRIS.

USEPA toxicity factors are used to assess potential health risks resulting from the estimated chemical intakes. Toxicity factors for noncarcinogenic effects are called reference doses (RfDs); toxicity factors for carcinogenic effects are called slope factors (SFs). An RfD is the daily dose of a chemical that is unlikely to result in noncancer toxic effects to humans over a lifetime of exposure. RfDs are expressed in terms of milligram chemical per kilogram body weight per day (mg/Kg-day). RfDs are usually derived from the highest dose that produced no effect in the most sensitive animal species tested, divided by uncertainty factors of 10 to 10,000 to provide a large margin of safety for human exposures. Therefore, RfDs are very health-protective, and it is very likely that higher doses of many chemicals could be well-tolerated.

Slope factors are used to estimate potential carcinogenic risks. The SF is a dose-response factor that is used to estimate the probability of an individual developing cancer as a result of exposure to a potential carcinogen. The USEPA SFs are upper 95th percentile confidence limits of the probability of response per unit intake of chemical over a lifetime and are expressed in terms of risk per mg/Kg-day or $(mg/Kg\text{-}day)^{-1}$. SFs are based on experimental animal data and epidemiological studies when available. USEPA states that carcinogenic risks estimated using SFs are upperbound estimates. This means that the actual risk is likely to be less than the predicted risk (USEPA 1989) and could be zero. Oral RfDs and SFs for each COC addressed in the Human Health Risk Assessment are presented in Tables 7.2 and 7.3. Additional toxicity data can be found in the Human Health Risk Assessment, Section 5.0 of the draft Site Assessment Report (WC 1994).

TABLE 7.1
CHEMICALS OF C NCERN (COC) LIST
SCREENING PROCESS FOR SURFACE SOILS*
WHITE ALICE SITE, ROAD OILING AREA, AND LANDFILL NO. 2
MURPHY DOME LRRS

Chemicals	Maximum Detected Concentration (mg/kg)	Background Concentration (mg/kg)	Normal Range in Alaskan Soils**	Normal Range in Western U S. Soils+	Retained as a COC?
Volatile Organics					
Toluene	0.0006	-	-	-	Y
Tetrachloroethene	0.005	-	-	-	Y
Chloroform	0 0001	-	-	-	Nx
Organochlorine Pesticides					
p, p'-DDD	0 043	ND	-	-	Y
p, p'-DDT	0.160	ND	-	-	Y
arochlor 1260	0.340	-	-	-	Y
endrin aldehyde	0 011	-	-	-	Y
Metals * **					
Arsenic	0.710	6.2 - 23.7	<10	<0.2 - 97	N
Chromium	5.200	14 - 29.3	>80	3 - 2,000	N
Lead	35.000	8 4 - 15	18	10 - 700	Y^

* Includes wet soils described as sediments in reports. Surface soils were collected from 2 5 feet depth or shallower.

+ Source: Conner and Shacklette 1975: Shacklette and Boerngen 1985

- Indicates data not available

^ Although the maximum detected concentration for lead is below the normal range in western U S soils, it is retained as a COC because it far exceeds the background level and normal Alaskan soils level

** Source. Gough L.P., R.C. Severson, & H.T. Shacklette 1988

*** Background metals concentrations are ranges from two 1992 background samples (a surface soil and a sediment) and a 1993 sediment sample.

x Chloroform is a common laboratory contaminant, and its low concentration in one sample does not warrant its inclusion as a COC

TABLE 7.2

REFERENCE DOSES FOR NONCARCINOGENIC CHEMICALS OF CONCERN
MURPHY DOME LRRS

Chemical	Oral Rfd (mg/kg-day)	Source	Uncertainty Factor	Confidence Level	Critical Effect	Species/Experiment/Target Organ
p,p'-DDT	5×10^{-4}	I	100	Medium	Liver lesions	Rats, 0.05 mg/kg/day oral, 27 weeks; liver
Tetrachloroethene	1×10^{-2}	I	1000	Low	Hepatotoxicity, increased liver weight	Rats, mice, 14 mg/kg/day, oral; 6 weeks.
Toluene	2×10^{-1}	I	1000	Medium	Liver/kidney altered weight	Rats, 223 mg/kg/day oral gavage, 13 weeks, liver, kidney

I Verifiable in IRIS

TABLE 7.3

SLOPE FACTORS FOR CARCINOGENIC CHEMICALS OF CONCERN
MURPHY DOME LRRS

Chemical	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Source	EPA Class	Critical Effect	Species/Experiment/Target Organs
4,4'-DDD	2.4×10^{-1}	1	B2	Liver carcinoma	Mouse, oral diet, liver
4,4'-DDT	3.4×10^{-1}	1	B2	Neoplasia	Mouse, rat, diet; liver
Tetrachloroethene	5.2×10^{-2}	3	B2-C	Leukemia, liver tumors	Mouse, gavage

1 Verifiable in IRIS

8.0
EVALUATION OF RISK

WC conducted an Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA) as part of the 1993 study. The two risk assessments are included as Sections 5.0 and 6.0 of the Draft SA report (WC 1994) and can be referred to for details of the risk assessments. This section is a brief summary of the findings of the ERA and the HHRA.

8.1 ECOLOGICAL RISK ASSESSMENT

The ERA for the Murphy Dome LRRS incorporated several tools to evaluate existing or potential ecological risk to on-site receptors. The data evaluation included identification of COCs in the environmental media and comparison of the chemical data to criteria and literature values. In addition, some quantitative evaluations were performed to estimate the dose concentrations of COCs to key receptor species.

Woodward-Clyde performed an exposure assessment for the terrestrial community of Murphy Dome. It involved the identification and evaluation of ecological risks due to exposure to COCs in soil and consumption of COCs in prey items. The two key receptors selected were the willow ptarmigan and the arctic ground squirrel. The assessment evaluated bioaccumulation of chemicals in the food and levels of chemicals in soil and compared dietary levels to literature toxic dose values.

The ecological risk assessment concluded there was a slight risk to receptors from the site contaminants. However, most of this risk is from the potential ingestion of lead found at a source site not covered by this NFRAP document.

8.2 HUMAN HEALTH RISK ASSESSMENT

Concentrations of organic compounds and metals in soils at Murphy Dome are not at levels of concern for human health effects under current and probable future industrial use exposure

scenarios. This conclusion is based on comparison of sample results to screening-level risk-based concentrations (RBCs), to other screening-level criteria for protection of groundwater, and to USEPA guidelines for lead concentrations in soil.

9.0
REFERENCES

Alaska Natural Heritage Program. 1993. Letter from E.W. West, May 11, 1993.

Alaska Department of Fish and Game. 1978. Alaska's Wildlife and Habitat, Vol. II.

Alaska Department of Fish and Game. 1990. Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes. Interior Region Resource Management, Region IV.

Alaska Department of Fish and Game. 1991. Refuges, Critical Habitat Areas and Sanctuaries. March 1991.

Alaska Department of Fish and Game. 1992.

Conner, J.J. and Shacklette, H.T. 1975. Background Geochemistry of Some Rocks, Soils, Plants, and Vegetables in the Conterminous United States. Geological Survey Professional Paper 574-F.

Craig, Bob. 1994. Natural Resource Manager, Alaska Department of Natural Resources. Fairbanks, Alaska. Telephone Conversation with D. Morris, WC, Anchorage, AK. October 12, 1994.

Grandfield, Jack. Division of Property Management. North Star Borough. Fairbanks, AK. Telephone Conversation with D. Morris. October 13, 1994.

Gouge, L.P., Severson, R.C. and Shacklette, H.T. 1988. Element Concentrations in Soils and Other Surficial Materials of Alaska. U.S. Geological Survey Professional Paper 1458, 53pp.

King, Carolyn. 1990. The Natural History of Weasels and Stoats. Cornell University Press. 253 pp.

Hancock, Tom. Division of Property Management. North Star Borough. Fairbanks, AK. Telephone Conversation with D. Morris. October 13, 1994.

Milles, Chris. 1994. Alaska Department of Natural Resources. Fairbanks, Alaska. Telephone Conversation with D. Morris, WC, Anchorage, AK. October 13, 1994.

Murie, J.O. and Michener, G.R. 1984. The Biology of Ground-Dwelling Squirrels, Annual Cycles, Behavioral Ecology, and Sociality. University of Nebraska Press. 459 pp.

Shacklette, H.T. and Boerngen, J.G. 1985. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270.

Teres, J. 1991. Audubon Encyclopedia of North American Birds. Alfred A. Knopf, Inc.

U.S. Dept. of Agriculture, Soil Conservation Service, 1993. Fairbanks, Alaska. David Swanson. Personal Communication.

U.S. Environmental Protection Agency, 1989. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A). USEPA/540/1-89/002.

U.S. Environmental Protection Agency, 1990. Carcinogenicity Characterization of Perchloroethylene (PERC) (CASRN 127-18-4) and Trichloroethylene (TCE) (CASRN 79-01-6). Memorandum from Joan S. Dollarhide, Superfund Health Risk Technical Support Center, to Dan Stralka, USEPA Region 10.

U.S. Environmental Protection Agency, 1993. Health Effects Assessment Summary Tables (HEAST). Annual FY-1993 (including Supplement No. 1). OHEA ECAO-CIN-909. March 1993.

U.S. Environmental Protection Agency, 1994. Integrated Risk Information System (IRIS), on-line database.

U.S. Fish and Wildlife Service. 1992. National Wetlands Inventory Program.

Vierick, L.A. and E.L. Little, Jr. 1972. Alaska Trees and Shrubs. Agriculture Handbook No. 410. U.S. Dept. of Agriculture, Forest Service. Washington, D.C. Reprinted by University of Alaska Press. Fairbanks, Alaska.

Weeden, R.B., ADF&G. 1965. Grouse and Ptarmigan in Alaska, Their Ecology and Management. Federal Aid in Wildlife Restoration Project Report. Vo. V. Project W-6-R-5, Work Plan I.

Woodward-Clyde (WC). 1993. Natural Resource Plan for Interior Long Range Radar Sites (Fort Yukon, Murphy Dome, Indian Mountain, Tatalina, Sparrevohn). Prepared for the United States Air Force, 611 Air Control Wing, 611 Civil Engineering Operations Squadron, Elmendorf AFB, Alaska.

APPENDIX B

ADEC CORRESPONDENCE

MURPHY DOME LRRS, ALASKA

STATE OF ALASKA

TONY KNOWLES, GOVERNOR

Telephone: (907) 451-2360
Fax: (907) 451-2187

DEPT. OF ENVIRONMENTAL CONSERVATION
Northern Regional Office
610 University Avenue, Fairbanks, AK 99709-3643

NRO File: 100.38.040

Jan

Post-it® Fax Note 7671	Date 1/26/95 # of pages ▶ 2
To Steve Mattson	From L. Noland
Co./Dept.	Co.
Phone #	Phone # 451-2139
Fax # 552-1591 or 1533	Fax #

Lt. Colonel Rodney L. Hunt
611th CES/CE
21885 - 2nd Street
Elmendorf AFB, AK 99506-4460

Re: Final No Further Response Action Planned (NFRAP) Document
Murphy Dome LRRS, Alaska dated December 1994

Dear Colonel Hunt:

The Department of Environmental Conservation has completed its review of the above named document. The NFRAP document serves as a record that no further assessment or remediation is needed at the Landfill No.2 (LF04) site at Murphy Dome LRRS.

In a letter dated April 28, 1994, the Department agreed that the Road Oiling Site (OT05) and the White Alice Site (OT06) are no further action sites. The Department determined that the draft NFRAP document needed to provide further documentation concerning past sampling events, projected and present land use, and the possibility that ammunition may remain at Landfill No. 2. Upon review of the final document, the Department agrees that Landfill No. 2 is a no further action site based on the information presented in the final document.

The Department will require that the Air Force inform the Department of Natural Resource Management as to the boundaries of Landfill No. 2 by providing a detailed map of the site. According to the final report, 20 to 25 acres at the Landfill No. 2 site is available to the State for gravel extraction and the State needs to be given enough information about the Landfill so they may avoid excavating in the Landfill area.

If conditions should change at the above named sites, or if evidence should become available which indicates that more serious contamination problems exist then those reported in the draft and final NFRAP document, the Department may require that the Air Force conduct additional investigation and possible remediation at the site, or sites.

Thank you for the opportunity to review this document. Please contact Laura Noland at 907-451-2139, if you have any questions or comments concerning this letter.

Sincerely,

Laura Noland
Environmental Specialist

LN/rg (K:\eq\lauran\mdomenfa.126)
cc: R. Johnston, COE/Anchorage
S. Mattson, Elmendorf AFB
K. McCumby, ADEC/Fairbanks
N. Welch, ADNR/Fairbanks
R. Markey, ADEC/Fairbanks
T. Wingerter, ADEC/Fairbanks

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

Telephone: (907) 451-2360
Fax: (907) 451-2187

DEPT. OF ENVIRONMENTAL CONSERVATION

Northern Regional Office
1001 Noble Street, Suite 350, Fairbanks, AK 99701-4980

NRO File: 100.38.040

April 28, 1994

Lt. Colonel Rodney L. Hunt
11th Air Control Wing
21885 - 2nd Street
Elmendorf AFB, AK 99506-4460

Re: No Further Response Action Planned (NFRAP) Document Murphy Dome LRRS, Alaska, dated March 1994

Dear Colonel Hunt:

The Department of Environmental Conservation has completed its review of the above named document. The NFRAP document serves as a record that no further assessment or remediation is needed at the Road Oiling (OT05), White Alice (OT06), and Landfill No.2 (LF04) sites at Murphy Dome LRRS. The document has been prepared in accordance with the State of Alaska guidance document entitled "Draft ADEC - No Further Action Criteria for DOD Military/FUD Sites," dated June 8, 1992.

Road Oiling (OT05) and White Alice Site (OT06)

Based on the site investigation data presented in the document, the Department agrees that all chemicals detected at the Road Oiling and White Alice are below regulatory levels. The Department considers these two sites no further action sites.

The Department notes that the NFRAP fails to report that the State of Alaska has selected the Murphy Dome LRRS. Therefore, the potential for residential and recreational use may exist in the future. However, due to the lack of significant chemical contamination at the site, the Department agrees with no further status at these two sites.

If conditions should change at the above named sites, or if evidence should become available which indicates that more serious contamination problems exist then those reported in the NFRAP, the Department may require that the Air Force conduct additional investigation and possible remediation at the site, or sites.

Post-it™ brand fax transmittal memo 7671	# of pages ▸ 3
To Steve Mattson	From L. Neland
Co. IHMCES	Co. ADEC
Dept.	Phone #
Fax # 552-1533	Fax #

Landfill No. 2 (LF04)

Several important questions concerning this site remain unanswered in the NFRAP document. Specifically:

1) This document does not report on the sampling effort conducted in 1986 - 1987. This sampling project is described in the Air Force report entitled "IRP, Phase II - Confirmation/Quantification, Stage 1" by Woodward-Clyde Consultants, dated April 1989. A test pit was excavated 10 feet below the downslope toe of the landfill into natural grade to a depth of 2.5 feet. Petroleum hydrocarbons, benzene, ethylbenzene, toluene, 1,1-dichloroethene and 1,2-dichlorobenzene were detected (6.7 mg/Kg, 2800 ug/L, 520 ug/L, 960 ug/L, 210 ug/L, and 120 ug/L, respectively).

   The Department finds that these values are all below regulatory levels, however, the 1986 - 1987 sampling effort needs to be included in the NFRAP.

2) What is the primary present and future land use in the area surrounding Landfill No. 2? This site is located six miles from the Murphy Dome LRRS facility on Fairbanks North Star Borough land. According to the Air Force's 1989 report, "The property immediately to the east, the boundary of which appears to be along the toe of the landfill, belongs to the University of Alaska and is undeveloped (WCC, 1989)." What is the projected use of the land surrounding the Landfill No. 2, as well as the projected land use of the site itself?

3) Also found in the 1989 report is the following statement:

   The Landfill was apparently guarded by armed sentries during the period of operation, and according to an affidavit from the Alaska Department of Natural Resources, the landfill may contain live ammunition. (p. 7-3)

   The validity of this statement needs to be addressed in the NFRAP document. The possibility of live ammunition remaining on private property is a serious issue.

   To date, the Department is not aware of any data, or documentation to support the statement that live ammunition is at the site. According to the "Phase I - Records Search" report, dated September 1985: "None of the long-range radar sites included in this study of the AAC Northern Installations has had any disposal sites for explosives and munitions." However, the Air Force needs to either support or negate this statement in a systematic and documented manner.

To summarize, the Department agrees with the Air Force that Road Oiling (OT05) and White Alice Site (OT06) site are no further action sites. The Department finds that the NFRAP document needs further documentation concerning past sampling events, projected and present land use, and the possibility that ammunition may remain at the site for Landfill No. 2.

Thank you for the opportunity to review this document. Please contact Laura Noland at 451-2139, if you have any questions or comments concerning this letter.

Sincerely,

Laura Noland
Environmental Specialist

LN/blt [redacted]

cc: Robert Johnston, COE/Anchorage
Doug Lowery, ADEC/Fairbanks
Rielle Markey, ADEC/Fairbanks
Steve Mattson, Elmendorf AFB
Tim Wingerter, ADEC/Fairbanks

APPENDIX C

ADMINISTRATIVE RECORD INDEX

MURPHY DOME LRRS, ALASKA

MURPHY DOME LRRS ADMINISTRATIVE RECORD INDEX

Installation Restoration Program, Phase I - Records Search AAC - Northern Region: Galena AFS, Campion AFS, Cape Lisburne AFS, Fort Yukon AFS, Indian Mountain AFS, Kotzebue AFS, Murphy Dome AFS and Tin City AFS (Engineering Science (ES) 1985)

Installation Restoration Program, Phase II - Confirmation/Quantification, Stage I Campion, Fort Yukon, Galena, Indian Mountain, Murphy Dome, Cold Bay, and Sparrevohn Air Force Stations (Woodward-Clyde (WC), 1988)

Installation Restoration Program, Stage 1, Phase II Site Inspections Report for Fort Yukon, Murphy Dome, and Indian Mountain, Air Force Stations, Alaska (Woodward-Clyde (WC), 1990)

Preliminary Assessment, Murphy Dome LRRS Site (USAF - 11th CEOS/DEVR, 1992)

Site Investigation Report, Murphy Dome LRRS, Alaska (Woodward-Clyde (WC), 1993)

Draft Site Assessment Report, Murphy Dome LRRS, Alaska (Woodward-Clyde (WC), February 1994)

Murphy Dome Underground Storage Tank Removal Report (11th ACW/CE, February 1994)

Draft Remedial Investigation, Murphy Dome LRRS, Alaska (Woodward-Clyde (WC), March 1995)

Final No Further Response Action Planned Document, Murphy Dome LRRS, Alaska (Woodward-Clyde (WC), December 1994)

Draft Feasibility Study, Murphy Dome LRRS, Alaska (Woodward-Clyde (WC), July 1996)

Final Remedial Investigation, Murphy Dome LRRS, Alaska (Woodward-Clyde (WC), March 1996)