Record of Decision

SS003 (POL Tank Farm)
SS008 (WAA No. 4)
SS011 (WAA No. 1 and Downslope of Hardfill No. 1)
LF004 (Lower Landfill No. 2)

Final

TATALINA LONG RANGE RADAR SITE, ALASKA

Prepared By

United States Air Force

JOINT BASE ELMENDORF-RICHARDSON, ALASKA

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
Air Force	U.S. Air Force
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CEM	conceptual exposure model
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
COPC	chemical of potential concern
COPEC	contaminant of potential ecological concern
DDD	dichlorodiphenyldichoroethylene
DDT	dichlorodiphenyltrichloroethane
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DRO	diesel range organics
EPA	Environmental Protection Agency
EPC	exposure point concentrations
ERA	ecological risk assessment
ERP	Environmental Restoration Program
ESD	Explanation of Significant Differences
FS	Feasibility Study
GAC	granular articulated carbon
GRO	gasoline range organic
HHERA	human health and ecological risk assessment
HI	Hazard Index
HQ	hazard quotient
HRA	human health risk assessment
IC	institutional control
IRP	Installation Restoration Program
LNAPL	light non-aqueous phase liquid
LRRS	Long Range Radar Site
MAR	minimal attended radar
MCL	maximum contaminant level
mg/Kg	milligrams per kilogram
mg/Kg-d	milligrams per kilogram per day
mg/L	milligrams per liter
MoGAS	motor vehicle gasoline
MRL	minimum reporting limit
NCP	National Contingency Plan
ORC	oxygen releasing compounds
OU	Operable Unit

PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PHC	petroleum hydrocarbon
POL	petroleum, oil, and lubricants
PRG	preliminary remediation goal
RAO	remedial action objective
RBCL	risk-based cleanup level
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI	Remedial Investigation
ROD	Record of Decision
RRO	residual range organic
SARA	Superfund Amendments and Reauthorization Act
SVOC	semi-volatile organic compound
SW	EPA Solid Waste Procedure
TBC	to be considered
TCLP	toxicity characteristic leachate procedure
TMV	toxicity, mobility, and volume
TRV	toxicity reference values
UST	underground storage tank
VOC	volatile organic compound
WAA	Waste Accumulation Area
WACS	White Alice Communication System

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1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Facility Name: Tatalina Long Range Radar Site (LRRS)

Site Location: Tatalina, Alaska

CERCLIS ID Number: NOT APPLICABLE

Operable Unit/Site: Petroleum, Oil, and Lubricants (POL) Tank Farm (SS003)
Waste Accumulation Area (WAA) No. 4 (SS008)
WAA No. 1 and Downslope of Hardfill No. 1 (SS011)
Lower Landfill No. 2 (LF004)

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedies for Environmental Restoration Program (ERP) Sites SS003, SS008, SS011, and LF004 at Tatalina LRRS, in Tatalina, Alaska, which were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for these sites. ERP Sites SS008, SS011, and LF004 contain CERCLA hazardous substances, while ERP Site SS003 does not. However, all four sites were addressed under the CERCLA process.

This document is issued by the Department of Defense (DoD), U.S. Air Force (Air Force) as the lead agency. The Air Force is managing remediation of contamination at Tatalina LRRS in accordance with CERCLA as required by the Defense Environmental Restoration Program (DERP).

As the lead agency, the Air Force has selected the remedy. The Alaska Department of Environmental Conservation (ADEC) agrees that the selected remedies, when properly implemented, comply with state law. The U.S. Environmental Protection Agency (EPA) has deferred to ADEC for regulatory oversight of the ERP at Tatalina LRRS.

1.3 ASSESSMENT OF SITE

1.3.1 Assessment Under CERCLA

CERCLA hazardous substances have been identified as contaminants of concern (COCs) in SS008 soil and groundwater, SS011 surface soil, and LF004 surface soil and sediment. Areas within Tatalina LRRS cannot support unlimited use and unrestricted exposure due to hazardous substances and contaminants remaining in place after implementation of the selected remedies. Land use restrictions are required as part of this response action and will be achieved through imposition of institutional controls (ICs) that limit the use and/or exposure to those areas of the property, including water resources, that are contaminated. The response actions selected in this decision document for SS008, SS011, and LF004 are necessary to protect public health or

welfare and the environment from actual or threatened releases of hazardous substances into the environment. ERP Site SS011 has mixed CERCLA and petroleum constituents, so this site will be addressed under CERCLA, which will integrate the Alaska State Regulations.

1.3.2 Assessment Under Alaska State Regulations

Because petroleum substances are hazardous substances under State of Alaska laws and regulations, the four subject sites are being addressed under those applicable laws and regulations, including but not limited to, Title 46 of the Alaska Statutes and regulations promulgated thereunder. Petroleum has been detected at ERP Sites SS003, and SS008above cleanup levels protective of unrestricted use established in Alaska regulations. At ERP Site SS008, CERCLA and petroleum constituents are isolated from one another and will each have a different response. Sites SS003 and SS008, at Tatalina LRRS cannot support unlimited use and unrestricted exposure due to hazardous substances and contaminants remaining in place after implementation of the selected remedy. Land use restrictions are required as part of this response action and will be achieved through imposition of ICs that limit the use and/or exposure to those areas of the property, including water resources, that are contaminated.

The Air Force is committed to implementing, monitoring, maintaining, and enforcing all components of the selected remedy to ensure that it remains protective of human health and the environment.

1.4 DESCRIPTION OF SELECTED REMEDY

1.4.1 Remedies Selected Under CERCLA

Remedial alternatives for addressing CERCLA hazardous substances at SS008 and SS011 were developed and evaluated through a Feasibility Study (FS) (USAF, 2009b). Remedial alternatives for LF004 were developed and evaluated in the Proposed Plan (USAF, 2012). Based on the results of the FS, the Air Force selected Off-site Disposal through Landfilling for polychlorinated biphenyl (PCB) and tetrachloroethene (PCE) soil contamination at SS008, Long-term Monitoring with ICs for groundwater at SS008, and Off-site Disposal through Landfilling and ICs at SS011 as the selected remedies. At LF004, the selected remedy is long-term monitoring of groundwater with ICs for all media. The major components of the selected response actions are presented below.

At SS008, an estimated 25 cubic yards of PCB and PCE contaminated soil will be excavated and disposed of off-site in drums or Super Sacks®. Confirmation sampling will be conducted and clean fill (soil) from a local source will be used to backfill the excavated areas. A detailed delineation will be performed near the sediment sample that contained PCE, including installation of a new monitoring well. Long-term monitoring will be conducted for groundwater every 5 years until contaminants are below ADEC Table C cleanup levels for two consecutive sampling events.

At SS011, exposed debris and excavated stained soils and sediments will be disposed of at an off-site landfill.

At LF004, biennial cover evaluations will be completed, along with a 5-year inspection for 20 years. Long-term monitoring will be conducted for groundwater every 5 years until contaminants are below ADEC Table C cleanup levels for two consecutive sampling events to ensure no migration of contaminants from the landfill. A 20-year timeframe was used in the FS for the detailed analysis of total costs and is not necessarily the amount of time estimated to achieve clean-up levels. At least two additional monitoring wells will be installed to triangulate groundwater flow and verify no COCs are present in the groundwater.

The land at these sites is designated as industrial use only currently and in the future in the Base Master Plan. However, to assess the need for ICs, contamination present at the site was assessed for unlimited use and unrestricted exposure, in particular recreational and/or residential use. Groundwater is not safe for drinking as it is contaminated above maximum contaminant levels (MCLs). Accordingly, the radar facility must impose ICs to ensure the groundwater is not used for potable purposes until it is remediated to MCL levels. The objectives of ICs are to: prevent access or use of groundwater until cleanup levels are met; maintain the integrity of any current or future remedial or monitoring system such as monitoring wells; prohibit the development and use of property for residential housing, schools, child care facilities, or playgrounds; and prevent the use of contaminated soil for restricted uses in the event of excavation and implementation of a soils management plan.

The Air Force will implement, monitor, maintain, and enforce the ICs identified below in accordance with State of Alaska 18 Alaska Administrative Code (AAC) 75.375 Institutional Controls. The 611th Civil Engineering Squadron will be the point of contact for ICs. The major components of the selected response action will be implemented to restrict current and future access or exposure to soil and groundwater at these two ERP Sites. The following proposed ICs will be implemented:

- **Resource Uses, Risk Exposure Assumptions, and Risks Necessitating the ICs.** The state has designated all groundwater of the state as potential drinking water. The site currently does not use this aquifer as a potable drinking water source and does not plan on doing so in the future. However, to assess the need to ICs, contamination present in the plume was assessed for risk under a potable use scenario. Groundwater is not safe to use as drinking water because it is contaminated above MCLs. Accordingly, the site must impose ICs to ensure the groundwater is not used for potable purposes until it is remediated to MCL levels. The land use at these sites is designated as industrial use only currently and in the future in the Base Master Plan. However, to assess the need for ICs, contamination present at the sites was assessed for unlimited use and unrestricted exposure, in particular recreational and/or residential use. Residual soil contamination is not safe for recreational and/or residential use. ICs are, therefore, necessary to preclude such uses to control the disposition and use of any soil excavated from the site.
- **Performance Objectives and Duration.** ICs will be put in place in order to: prevent access or use of the groundwater until cleanup levels are met; maintain the integrity of any current or future remedial or monitoring system, such as monitoring wells; prohibit the development and use of property for residential housing, elementary and secondary schools, or child care facilities and playgrounds; prevent the use of contaminated soil for restricted uses in the event of excavation and implement soils management plan; and

maintain the landfill cover at LF004 in order to prevent direct exposure and water infiltration. The ICs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unlimited use and unrestricted exposure per ADEC concurrence.

- **Description of ICs and Performance Responsibilities.** The specific mechanism for achieving the performance objectives are:
    a) The site well permitting system will prevent any use of groundwater for drinking water.
    b) The site construction review process will prevent damage to existing monitoring wells.
    c) All ROD use limitations and exposure restrictions will be entered in the Base Master Plan and the Geographical Information System.
    d) The site construction review process will be used to avoid ground-disturbing construction activities and to ensure safe soil management procedures in areas with residual contamination.
    e) The site digging permit system will be used to avoid activities that could breach the landfill cover.
    f) The site Environmental Impact Analysis Process will be used to assess the potential environmental impact of any action proposed at the site.

  These mechanisms will be implemented and overseen by the 611th Civil Engineer Squadron. The Air Force is responsible for implementing, maintaining, monitoring, reporting and enforcing ICs. The Air Force is obligated to inform, monitor, enforce and bind, where appropriate, authorized lessees, tenants, contractors, and other authorized occupants of the site of ICs impacting the site.

- **Location and Notice of Environmental Contamination.** The Tatalina LRRS comprehensive map and Base Master Plan will be updated to show the boundaries of each site to restrict excavation of soil, as well as to prevent access to groundwater. As part of the update to the Base Master Plan, the Air Force will produce maps showing locations of the residual contamination, and will provide these maps to ADEC. The Base Master Plan will contain a map indicating site location, with restrictions on any invasive activities that could potentially result in exposure of contaminants. The ICs will be documented in the Air Force Real Property Records, Tatalina LRRS General Plan, and 611th Installation Restoration Program (IRP) Records. This will include: information about current land uses and allowed uses (prohibiting future residential land use), geographic boundaries of the ICs, an inspection of the site, and submittal of performance reports. A Notice of Environmental Contamination will be placed in the Alaska Department of Natural Resources' land records.

- **Notification of Transfers and Corrective Measures.** Timely notification to ADEC of planned transfers, to include federal-to-federal transfers, of property subject to ICs. The Air Force must provide notice to ADEC at least six (6) months prior to any transfer or sale of property containing ICs so that ADEC can be involved in discussions to ensure that appropriate provisions are included in the transfer or conveyance documents to maintain effective ICs. If it is not possible for the facility to notify ADEC at least 6

months prior to any transfer or sale, then the facility will notify ADEC as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to ICs. The Air Force agrees to provide ADEC with such notice, within the same time frames, for federal-to-federal transfer of property accountability. The Air Force shall provide either access to or a copy of the executed deed or transfer assembly to ADEC.

The Air Force shall also notify ADEC of any violation of the ICs or any other activity that is inconsistent with the ICs or IC objectives, as well as any obstacles to correcting the same. The Air Force must notify ADEC as soon as practicable, but no longer than 10 days after discovery, of any activity that violates or is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs. The Air Force must take prompt measures to correct the violation or deficiency and prevent its recurrence. In this notification, the Air Force will identify any corrective measures it has taken, or any corrective measures it plans to take, and the estimated time frame for completing them. For corrective measures taken after the notification, the Air Force shall notify ADEC when the measures are complete.

- **Monitoring, Reporting, and Concurrence.** The Air Force will follow the 611th Land Use Control Management Plan to receive ADEC approval for site activities. The Air Force will also include the IC provisions contained in this ROD into the 611th Land Use Control Management Plan. The Air Force will monitor and inspect all site areas subject to ICs and submit a performance report to ADEC every year, for the first 5 years after the date of the signed decision document, followed by a 5-year review. At that time, the frequency of inspections and reports may be reduced. The Air Force will also submit a long-term monitoring sampling plan and subsequent sampling reports to ADEC for approval prior to removal of ICs. The Air Force will not modify or terminate ICs or modify land uses that may impact the effectiveness of the ICs or take any anticipated action that may disrupt the effectiveness of the ICs or any action that may alter or negate the need for ICs without seeking and obtaining approval and/or review and comment from ADEC 45 days prior to the change of any required ROD modification.

1.4.2 Remedies Selected Under State of Alaska Regulations

Remedial alternatives for addressing petroleum contamination at Tatalina LRRS were developed and evaluated through a FS (USAF, 2009b), and preferred remedial alternatives were presented in a Proposed Plan (USAF, 2012). Based on the results of the FS and Proposed Plan, the Air Force selected Bioremediation through In-situ Landfarming at SS003 and SS008, Long-term Monitoring at SS003, and ICs at all sites as the selected remedies for Tatalina LRRS. At ERP Site SS008, CERCLA and petroleum constituents are isolated from one another and will each have a different response. This section describes the petroleum response at SS008.

At SS003, surface soil will undergo Bioremediation through In-situ Landfarming (down to 2 feet below ground surface [bgs]). This will be accomplished over a 2-year period, including application of nutrients and routine tilling and sampling. Long-term monitoring will be conducted for groundwater every 5 years until contaminants are below ADEC Table C cleanup levels for two consecutive sampling events. A 20-year timeframe was used in the FS for the detailed analysis of total costs and is not necessarily the amount of time estimated to achieve

clean-up levels. A detailed delineation will be completed to determine the extent of diesel range organics (DRO) contamination located downgradient of the site by Sample SL39.

At SS008, surface soil will undergo Bioremediation through In-situ Landfarming (down to 2 feet bgs). This will be accomplished over a 2-year period, including application of nutrients and routine tilling and sampling. A detailed delineation will be completed to determine the extent of light non-aqueous phase liquid (LNAPL) contamination present in the vicinity of Monitoring Well BH37/MW through characterization of the product and product skimming.

The land at these sites is designated as industrial use only currently and in the future in the Base Master Plan. However, to assess the need for ICs, contamination present at the site was assessed for unlimited use and unrestricted exposure, in particular recreational and/or residential use. Groundwater is not safe for drinking because it is contaminated above MCLs. Accordingly, the site must impose ICs to ensure the groundwater is not used for potable purposes until it is remediated to MCL levels. The objectives of ICs are to: prevent access or use of groundwater until cleanup levels are met; maintain the integrity of any current or future remedial or monitoring system such as monitoring wells; prohibit the development and use of property for residential housing, schools, child care facilities, or playgrounds; and prevent the use of contaminated soil for restricted uses in the event of excavation and implement soils management plan.

The Air Force will implement, monitor, maintain, and enforce the ICs identified below in accordance with State of Alaska 18 Alaska Administrative Code (AAC) 75.375 Institutional Controls. The 611th Civil Engineering Squadron will be the point of contact for ICs. The major components of the selected response action will be implemented to restrict current and future access or exposure to soil and groundwater at SS003 and SS008. The following proposed ICs will be implemented:

- **Resource Uses, Risk Exposure Assumptions, and Risks Necessitating the ICs.** The state has designated all groundwater of the state as potential drinking water. The site currently does not use this aquifer as a potable drinking water source and does not plan on doing so in the future. However, to assess the need to ICs, contamination present in the plume was assessed for risk under a potable use scenario. Groundwater is not safe for drinking water because it is contaminated above MCLs. Accordingly, the site must impose ICs to ensure the groundwater is not used for potable purposes until it is remediation to MCL levels. The land use at SS003 and SS008 is designated as industrial use only currently and in the future in the Base Master Plan. However, to assess the need for ICs, contamination present at the site was assessed for unlimited use and unrestricted exposure, in particular recreational and/or residential use. Residual soil contamination is not safe for recreational and/or residential use. ICs are, therefore, necessary to preclude such uses to control the disposition and use of any soil excavated from the site.
- **Performance Objectives and Duration.** ICs will be put in place in order to: prevent access or use of the groundwater until cleanup levels are met; maintain the integrity of any current or future remedial or monitoring system such as monitoring wells; prohibit the development and use of property for residential housing, elementary and secondary schools, or child care facilities and playgrounds; prevent the use of contaminated soil for

restricted uses in the event of excavation and implement soils management plan; and maintain the landfill cover at LF004 in order to prevent direct exposure and water infiltration. The ICs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unlimited use and unrestricted exposure per ADEC concurrence.

- **Description of ICs and Performance Responsibilities.** The specific mechanism for achieving the performance objectives are:
  a) The site well permitting system will prevent any use of groundwater for drinking water.
  b) The site construction review process will prevent damage to existing monitoring wells.
  c) All Record of Decision (ROD) use limitations and exposure restrictions will be entered in the Base Master Plan and the Geographical Information System.
  d) The site construction review process will be used to avoid ground-disturbing construction activities and to ensure safe soil management procedures in areas with residual contamination.
  e) The site digging permit system will be used to avoid activities that could breach the landfill cover.
  f) The site Environmental Impact Analysis Process will be used to assess the potential environmental impact of any action proposed at the site.

  These mechanisms will be implemented and overseen by the 611th Civil Engineer Squadron. The Air Force is responsible for implementing, maintaining, monitoring, reporting and enforcing ICs. The Air Force is obligated to inform, monitor, enforce and bind, where appropriate, authorized lessees, tenants, contractors, and other authorized occupants of the site of ICs impacting the site.

- **Location and Notice of Environmental Contamination.** The Tatalina LRRS comprehensive map and Base Master Plan will be updated to show the boundaries of each site to restrict excavation of soil, as well as to prevent access to groundwater. As part of the update to the Base Master Plan, the Air Force will produce maps showing locations of the residual contamination, and will provide these maps to ADEC. The Base Master Plan will contain a map indicating site location, with restrictions on any invasive activities that could potentially result in exposure of contaminants. The ICs will be documented in the Air Force Real Property Records, Tatalina LRRS General Plan, and 611th IRP Records. This will include: information about current land uses and allowed uses (prohibiting future residential land use), geographic boundaries of the ICs, an inspection of the site, and submittal of performance reports. A Notice of Environmental Contamination will be placed in the Alaska Department of Natural Resources' land records.

- **Notification of Transfers and Corrective Measures.** Timely notification to ADEC of planned transfers, to include federal-to-federal transfers, of property subject to ICs. The Air Force must provide notice to ADEC at least six (6) months prior to any transfer or sale of property containing ICs so that ADEC can be involved in discussions to ensure that appropriate provisions are included in the transfer or conveyance documents to

maintain effective ICs. If it is not possible for the facility to notify ADEC at least 6 months prior to any transfer or sale, then the facility will notify ADEC as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to ICs. The Air Force agrees to provide ADEC with such notice, within the same time frames, for federal-to-federal transfer of property accountability. The Air Force shall provide either access to or a copy of the executed deed or transfer assembly to ADEC.

The Air Force shall also notify ADEC of any violation of the ICs or any other activity that is inconsistent with the ICs or IC objectives, as well as any obstacles to correcting the same. The Air Force must notify ADEC as soon as practicable, but no longer than 10 days after discovery, of any activity that violates or is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs. The Air Force must take prompt measures to correct the violation or deficiency and prevent its recurrence. In this notification, the Air Force will identify any corrective measures it has taken, or any corrective measures it plans to take, and the estimated time frame for completing them. For corrective measures taken after the notification, the Air Force shall notify ADEC when the measures are complete.

- **Monitoring, Reporting, and Concurrence.** The Air Force will follow the 611th Land Use Control Management Plan to receive ADEC approval for site activities. The Air Force will also include the IC provisions contained in this ROD into the 611th Land Use Control Management Plan. The Air Force will monitor and inspect all site areas subject to ICs and submit a performance report to ADEC every year, for the first 5 years after the date of the signed decision document, followed by a summary report of the previous 5 years. At that time, the frequency of inspections and reports may be reduced. The Air Force will also submit a long-term monitoring sampling plan and subsequent sampling reports to ADEC for approval prior to removal of ICs. The Air Force will not modify or terminate ICs or modify land uses that may impact the effectiveness of the ICs or take any anticipated action that may disrupt the effectiveness of the ICs or any action that may alter or negate the need for ICs without seeking and obtaining approval and/or review and comment from ADEC 45 days prior to the change of any required ROD modification.

ERP Sites SS003, SS008, SS011, and LF004 are four of 12 ERP Sites at Tatalina LRRS. The overall cleanup strategy for Tatalina LRRS is to protect human health and the environment for recreational land use. The alternatives selected for SS003, SS008, SS011, and LF004 fit into the overall site management plan, because they are consistent with remedies selected for other sites at Tatalina LRRS.

1.5 STATUTORY DETERMINATIONS

1.5.1 CERCLA

The selected remedies for SS008, SS011, and LF004 are protective of human health and the environment, comply with promulgated requirements that are applicable or relevant and appropriate to the remedial action, and are cost effective.

The selected remedies of off-site disposal of PCB/PCE contaminated soil and long-term groundwater monitoring at SS008, off-site disposal of debris and contaminated soil at SS011,

and ICs at LF004 represent the maximum extent to which permanent solutions can be used in a practicable manner at a site. The remedies provide the best balance or trade-offs in terms of balancing criteria, while also considering the bias against offsite treatment and disposal and considering state and community acceptance.

The NCP establishes the expectation that treatment will be used to address the principal threats posed by a site whenever practicable (40 Code of Federal Regulations [CFR] 300.430[a] [1] [iii] [A]). The selected remedies for SS008, SS011, and LF004 do not satisfy the statutory preference for treatment as a principal element of the remedy, because the contamination will be removed from Tatalina LRRS and disposed of at a permitted Toxic Substances Control Act (TSCA) facility.

ERP Site SS008. Because the selected remedy for SS008 will result in hazardous substances, pollutants, or contaminants remaining on-site in SS008 groundwater above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment, and every 5 years thereafter until cleanup levels are met.

ERP Site SS011. Because the selected remedy for SS011 will result in hazardous substances, pollutants, or contaminants remaining on-site in SS011 soil above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

ERP Site LF004. Because the selected remedy for LF004 will result in hazardous substances, pollutants, or contaminants remaining on-site at LF004 above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment, and every 5 years thereafter until cleanup levels are met.

1.5.2 Remedies Required Under State of Alaska Regulations

The selected remedies for ERP Sites SS003, SS008, SS011, and LF004 are protective of human health and the environment, and comply with promulgated requirements. Because these remedies will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment, and every 5 years thereafter until cleanup levels are met.

1.6 DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD (Section 2). Additional information can be found in the Administrative Record file for ERP Sites SS003, SS008, SS011, and LF004 at Tatalina LRRS, Alaska, which can be found at http://www.adminrec.com.

- List of COCs and their respective concentrations:

See **Section 2.7** – Summary of Site Risks.

- Baseline risk represented by the COCs:
  See **Section 2.7** – Summary of Site Risks.
- Cleanup levels established for COCs and the basis for these levels:
  See **Section 2.12** – Selected Remedies.
- How source materials constituting principal threats will be addressed:
  See **Section 2.11** – Principal Threat Wastes.
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD:
  See **Section 2.6** – Current and Potential Future Land Resource Uses.
- Potential land and groundwater use that will be available at the site as a result of the selected remedy:
  See **Section 2.6** – Current and Potential Future Land Resource Uses.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected:
  See **Section 2.12** – Selected Remedies.
- Key factor(s) that led to selecting the remedy (i.e., describe how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision):
  See **Section 2.12** – Selected Remedies.

1.7 AUTHORIZING SIGNATURES

This signature sheet documents the Air Force's approval of the remedy selected in this ROD for ERP Sites SS003, SS008, SS011, and LF004 at Tatalina LRRS, Alaska. It also indicates ADEC's agreement that the selected remedies, when properly implemented, comply with state law.

ROBYN M. BURK, Colonel, USAF
Commander, 611th Air Support Group

Date 1/31/2013

JOHN HALVERSON, Environmental Program Manager
Federal Facilities Section, Contaminated Sites Program
Alaska Department of Environmental Conservation

Date 1/31/13

2.0 DECISION SUMMARY

The Decision Summary identifies the Selected Remedies, explains how the remedies fulfill statutory and regulatory requirements, and provides a substantive summary of the Administrative Record file that supports the remedy selection decision.

2.1 SITE NAME, LOCATION, AND DESCRIPTION

Tatalina LRRS is located in a remote area in the upper Kuskokwim Rivera area, 240 miles northwest of Anchorage (**Figure 2-1**). The nearest communities are McGrath and Takotna. McGrath, with a population of 401, is situated approximately 14 miles east of Tatalina LRRS and is not connected to Tatalina LRRS by road. Takotna, a small community of 50 residents, lies about 10 miles northwest of the installation, and is connected by a road to the installation (Figure 2-1).

Figure 2-2 provides an overview of the Tatalina LRRS installation. The four ERP sites addressed in this ROD are described briefly as follows:

- **POL Tank Farm (SS003).** SS003 consists of eight tanks that comprised the former POL Tank Farm and is located near the southwestern portion of Lower Camp (**Figure 2-3**). This area was used for aboveground diesel and motor vehicle gas (MOGAS) fuel storage and dispensing from the 1950s to 1997. Prior to the 1997 field investigation, the 611th Civil Engineering Squadron cleaned and removed three bulk diesel and two bulk MOGAS out-of-service storage tanks from the area. The tank removal project did not investigate or remove soil or the liner within the storage tank bermed areas. Site records indicate that the POL Tank Farm bermed area was previously drained. Water was released into the top of the drainage area that begins just below the POL Tank Farm pad. The drainage system might have released petroleum hydrocarbons (PHCs) into the drainage. Four fuel spills are cited in site records: 1,000 gallons in 1980, 500 gallons in 1981, 500 gallons in 192, and several hundred gallons in the 1970s (USAF, 2004). Records indicate that a liner was installed in the bermed POL Tank Farm area in 1983.
- **WAA Number 4, Old Sanitary Sewer Systems, Former Sewage Lagoon, and Former Paint Shop (SS008).** WAA No. 4 was used from the 1950s to 1984 to store waste oil drums from the former motor pool. It was located on the eastern side of a large flat gravel pad near the former garage and vehicle storage building (**Figure 2-4**). The former Lower Camp structures were built on this pad. These structures, including the garage and vehicle storage building, were demolished and removed in the mid-1980s. Some debris was removed from the site, and some debris was buried on site in cells adjacent to the structures' former location. This source area also includes the old septic tank. During the years of operation, all drains from the Lower Camp facility were connected to this system.
- **WAA Number 1 and Hardfill Number 1 (SS011)**. SS011 includes two collocated historical disposal areas: Hardfill No. 1 and WAA No. 1 (**Figures 2-5** and **2-6**). Construction and demolition debris was disposed of in Hardfill No. 1, and approximately 150 drums were disposed of in WAA No. 1. Precise location, condition, and content of the drums were unknown (USAF, 1998b).

- **Landfill Number 2 (LF004)**. This landfill consists of Lower Landfill No. 2 (**Figure 2-7**). This landfill was used to bury wastes from the mid-1960s to around 2000. A new landfill was constructed in 2002, covering approximately 80 percent of the former landfill. The remaining 20 percent is being visually inspected by the Tatalina LRRS Base Operations Contractor on a regular basis.

As the lead agency for remedial activities, the Air Force has conducted environmental restoration at the Tatalina LRRS ERP Sites SS003, SS008, SS011, and LF004 in accordance with CERCLA under the DERP, which was established by Section 211 of SARA.

As the support agency for CERCLA releases and the lead agency for releases involving petroleum, ADEC provides primary oversight of the environmental restoration actions. In the past, the EPA has not provided comments on documents for Tatalina LRRS sites, generally deferring regulatory oversight to ADEC.

Funding for remedial activities is provided by the Defense Environmental Restoration Account; a funding source approved by Congress to clean up contaminated sites on DoD installations.

2.2 SITE HISTORY

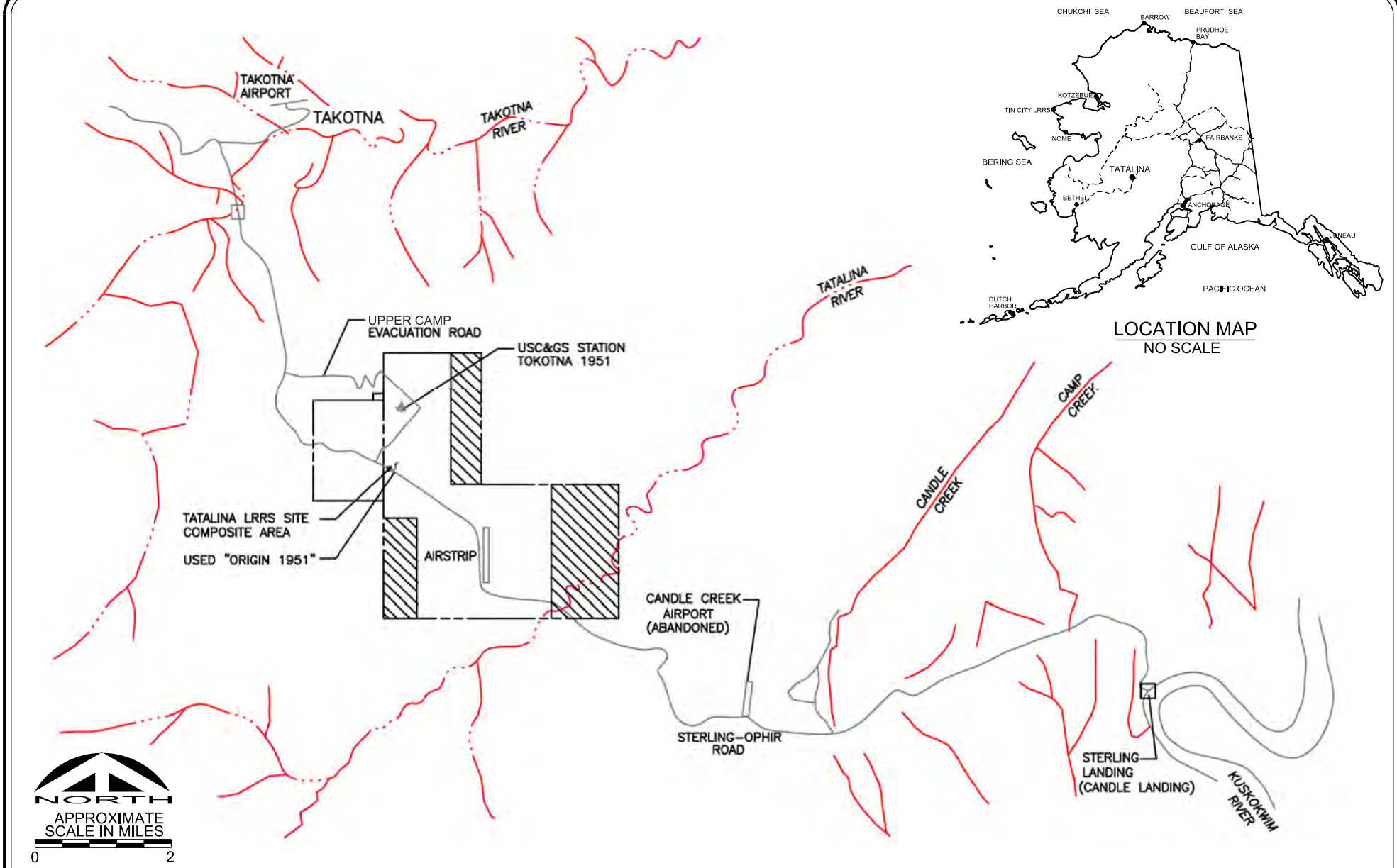
Tatalina LRRS is composed of four areas: Upper Camp on Takotna Mountain, Lower Camp, the Airstrip, and the Sterling Landing (barge landing) site along the Kuskokwim River (Figures 2-1 and 2-2). The installation was established in 1952, and is one of the many communication sites owned by the Air Force as part of a defense communication network and aircraft warning system across Alaska. The White Alice Communication System (WACS) began operations in 1957 and operated until 1979.

Operations at Tatalina LRRS have included POL transfer and storage, vehicle and electronic system maintenance, fire training, waste disposal (landfills), and road and runway oiling. Sterling Landing, located on the Kuskokwim River 16 miles east of the installation, is the off-loading location for barges delivering supplies, including fuel and other petroleum products, to Tatalina LRRS that might have impacted the environment. The site is still active, but Tatalina LRRS facilities have been downscaled (or eliminated) since the 1980s.

The sites that are addressed in this ROD are as follows:

- **ERP Site SS003** consisted of eight tanks that comprised the former POL Tank Farm and is located near the southwestern portion of Lower Camp. This area was used for aboveground diesel and MOGAS fuel storage and dispensing from the 1950s to 1997.
- **Site SS008** consists of the former WAA No. 4, the old sanitary sewer system, the former sewage lagoon, and former paint shop. WAA No. 4 was used from the 1950s to 1984 to store waste oil drums from the former motor pool. It was located on the eastern side of a large flat gravel pad near the former garage and vehicle storage building. The former Lower Camp structures were built on this pad. These structures, including the garage and vehicle storage building, were demolished and removed in the mid-1980s. Some debris was removed from the site, and some debris was buried on site in cells adjacent to the

JOB No. 1009128.04020402 TIME: 01-FEB-2013 11:16 FILE: D:\CAD\Proj\AFCEE\Tatalina\2012 Record of Decision\final\FIG2-1 Loacation-Vicinity Map.DGN



LOCATION MAP
NO SCALE

LEGEND:

RELINQUISHED TO U.S. DEPARTMENT OF THE INTERIOR

FIGURE 2-1

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

LOCATION AND VICINITY MAP

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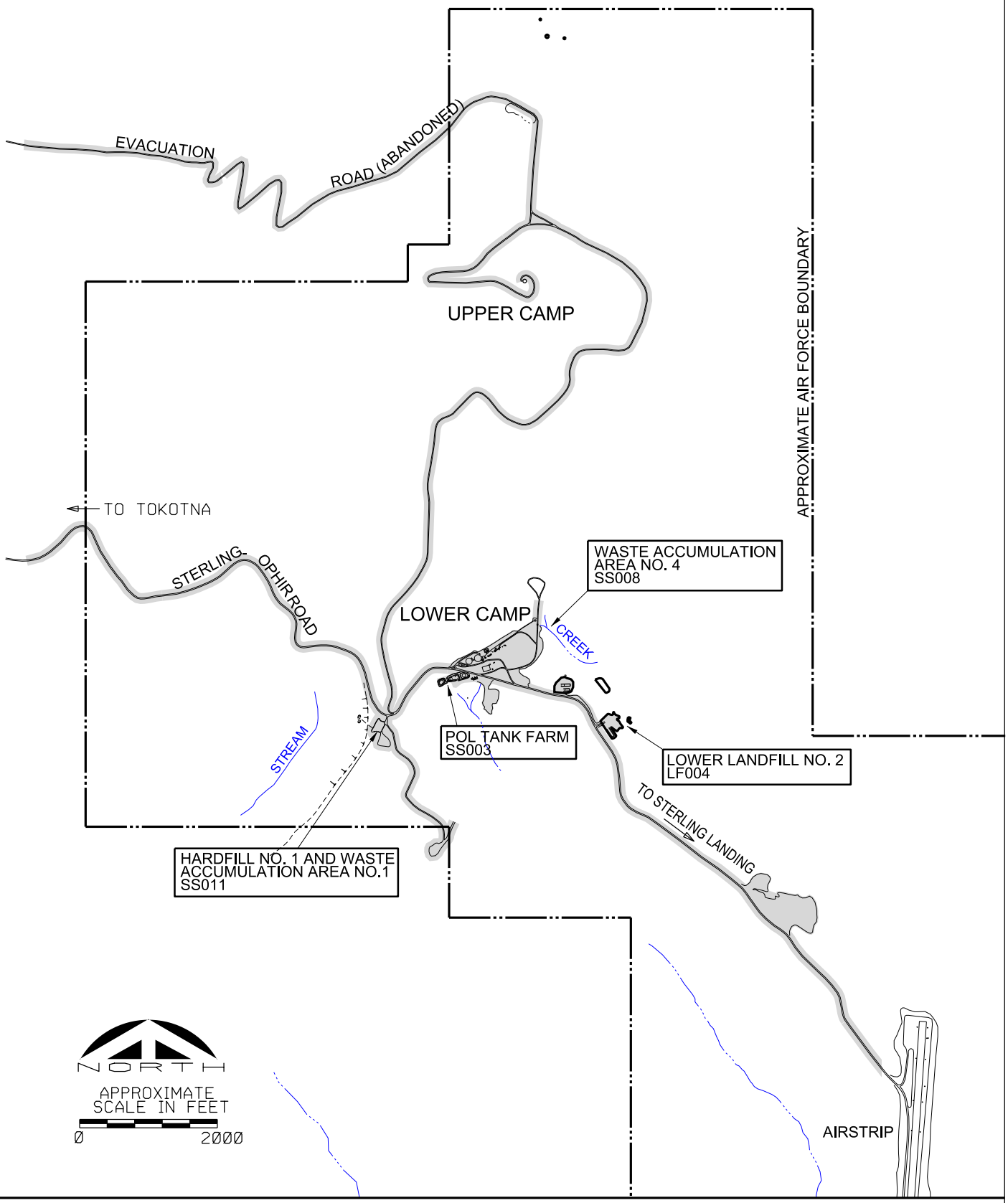

FIGURE 2-2

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

SITE MAP

JOB No. 1009128.04020402 TIME: 01-FEB-2013 11:20 FILE: D:\CAD\Proj\AFCEE\Tatalina\2012 Record of Decision\final\FIG2-2 Site Map.DGN

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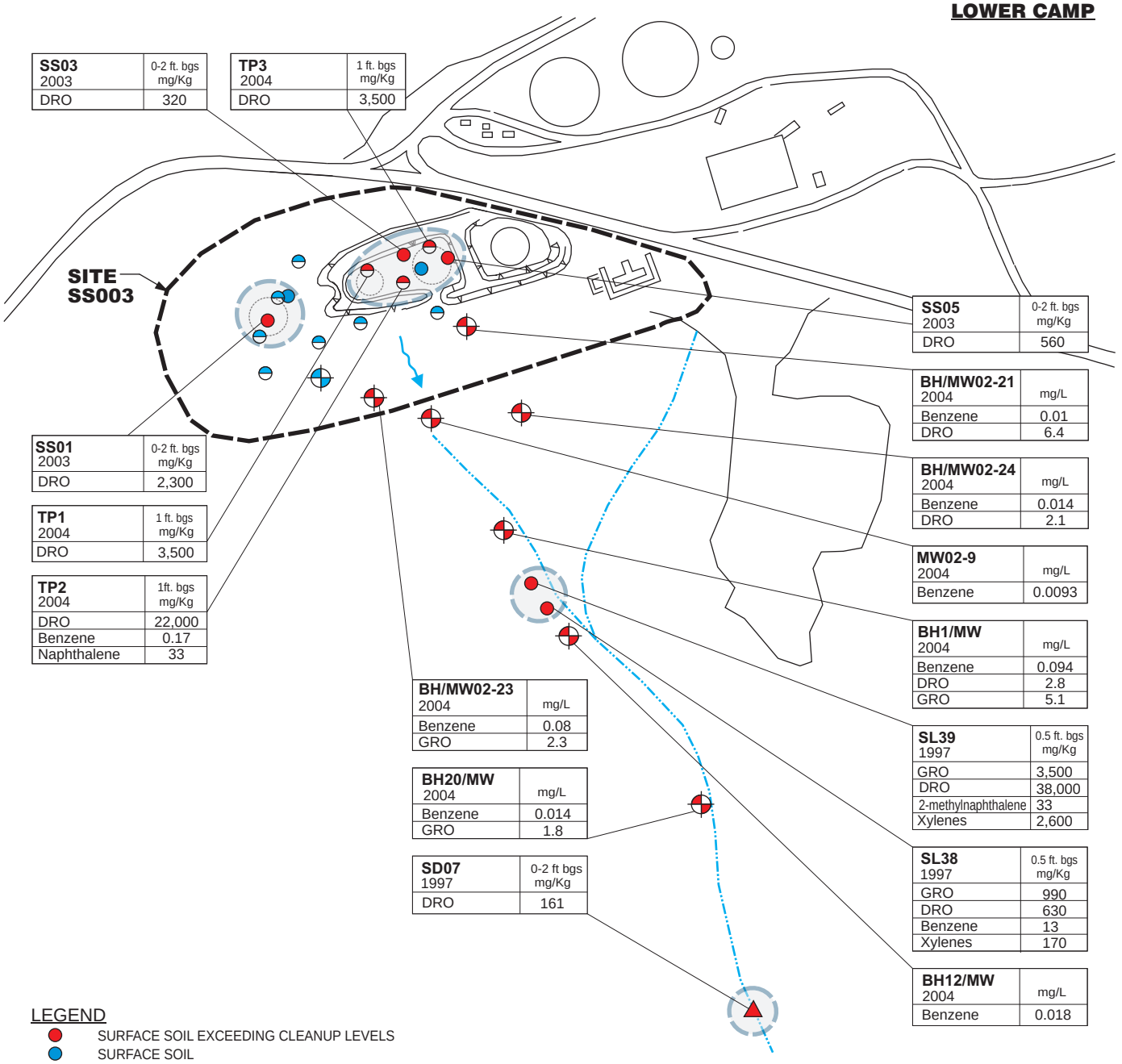

FIGURE 2-3

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ERP SITE SS003 ATTAINMENT AREA

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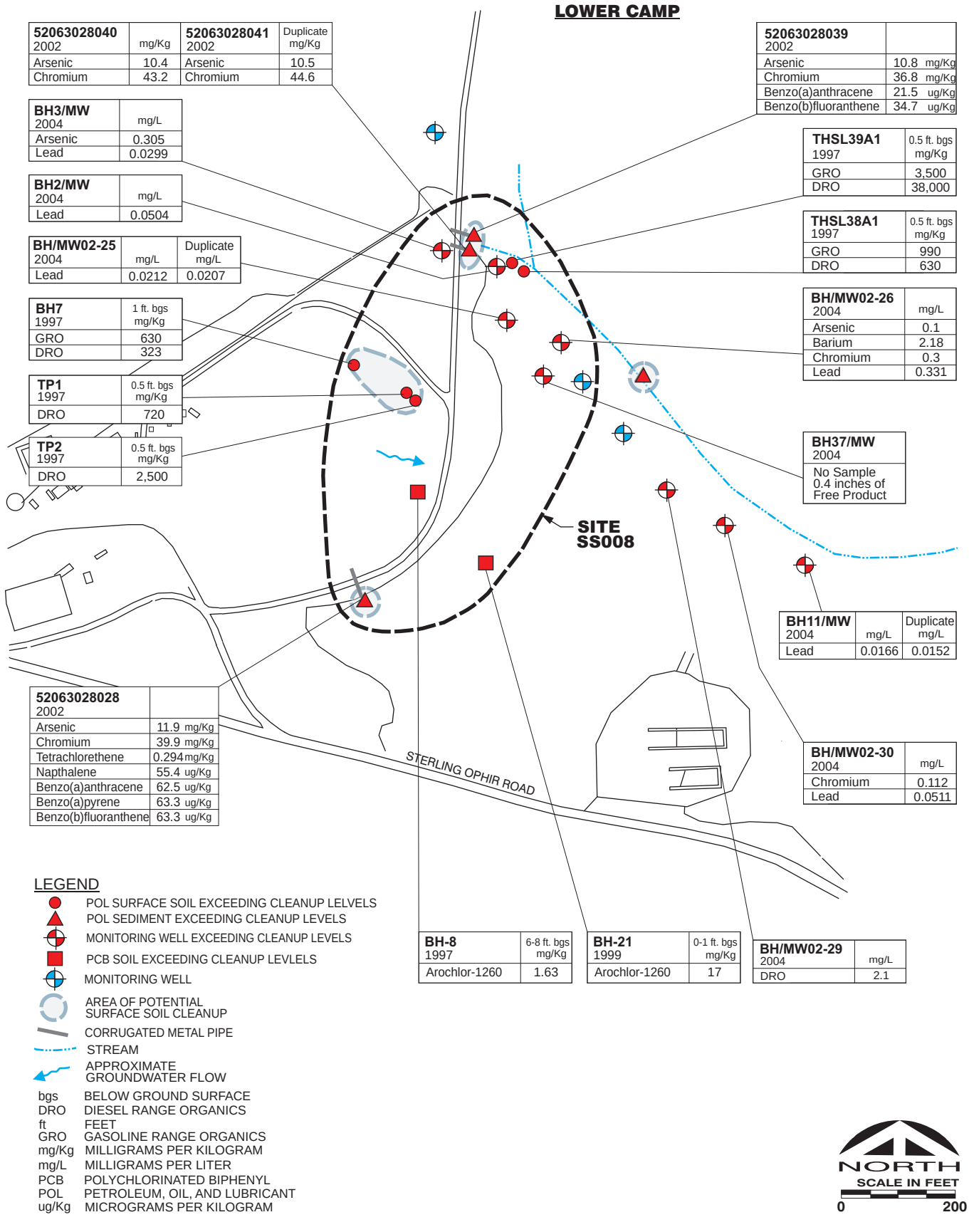

FIGURE 2-4

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ERP SITE SS008 ATTAINMENT AREA

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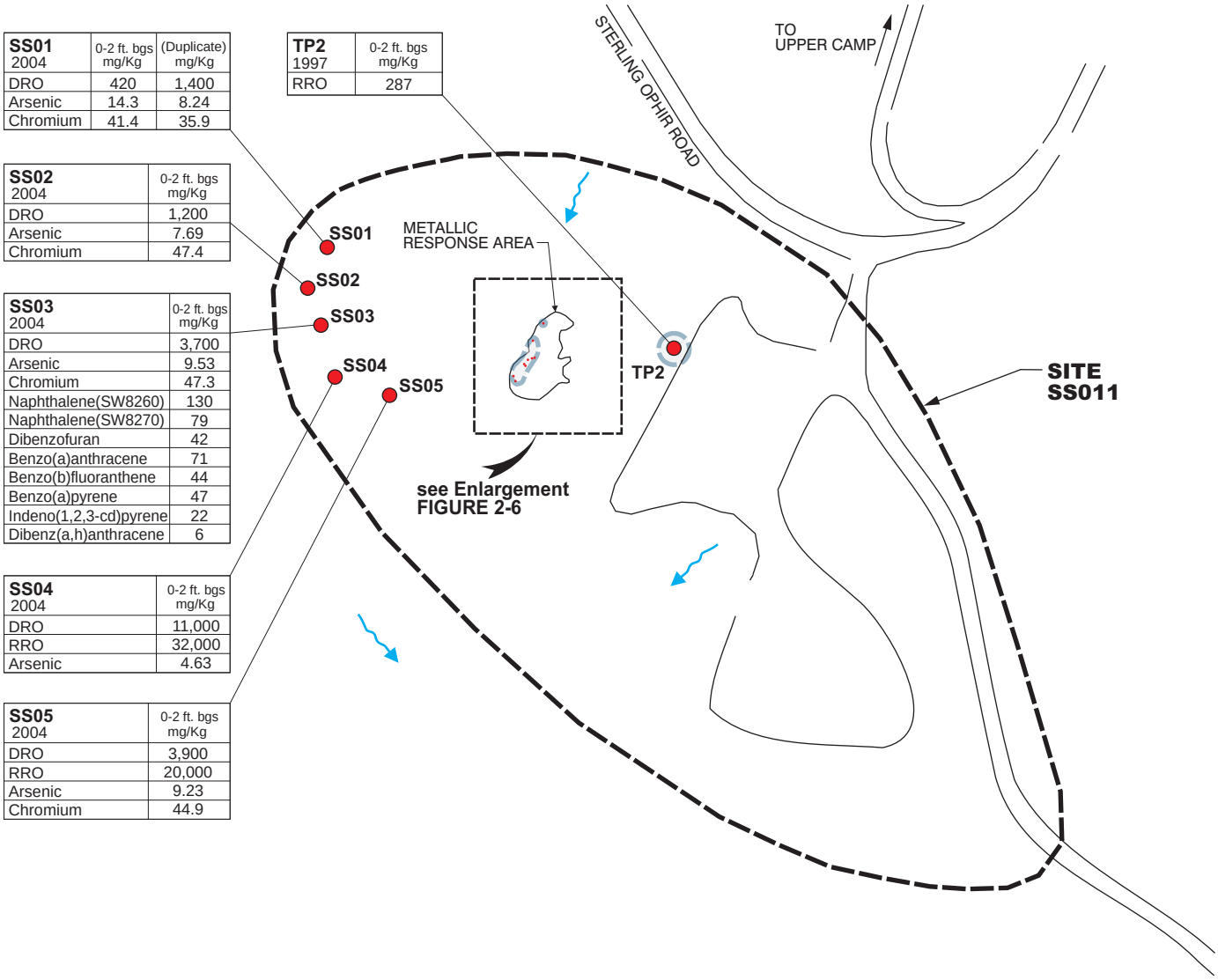
LOWER CAMP



SS01 2004	0-2 ft. bgs mg/Kg	(Duplicate) mg/Kg
DRO	420	1,400
Arsenic	14.3	8.24
Chromium	41.4	35.9

TP2 1997	0-2 ft. bgs mg/Kg
RRO	287

SS02 2004	0-2 ft. bgs mg/Kg
DRO	1,200
Arsenic	7.69
Chromium	47.4

SS03 2004	0-2 ft. bgs mg/Kg
DRO	3,700
Arsenic	9.53
Chromium	47.3
Naphthalene(SW8260)	130
Naphthalene(SW8270)	79
Dibenzofuran	42
Benzo(a)anthracene	71
Benzo(b)fluoranthene	44
Benzo(a)pyrene	47
Indeno(1,2,3-cd)pyrene	22
Dibenz(a,h)anthracene	6

SS04 2004	0-2 ft. bgs mg/Kg
DRO	11,000
RRO	32,000
Arsenic	4.63

SS05 2004	0-2 ft. bgs mg/Kg
DRO	3,900
RRO	20,000
Arsenic	9.23
Chromium	44.9

LEGEND

- SURFACE SOIL EXCEEDING CLEANUP LEVELS
- AREA OF POTENTIAL SURFACE SOIL CLEANUP
- APPROXIMATE GROUNDWATER FLOW

bgs	BELOW GROUND SURFACE
DRO	DIESEL RANGE ORGANICS
ft	FEET
mg/Kg	MILLIGRAMS PER KILOGRAM
RRO	RESIDUAL RANGE ORGANICS

Notes:
1. Metallic Response Area was defined using a hand-held metal detector and defines the lateral extent of the zone where additional drums may occur.
2. No subsurface soil or groundwater samples were collected at SS011 due to the steep terrain, shallow bedrock, and soil type consisting of large cobbles.

NORTH
SCALE IN FEET
0 150

FIGURE 2-5

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ERP SITE SS011 ATTAINMENT AREA

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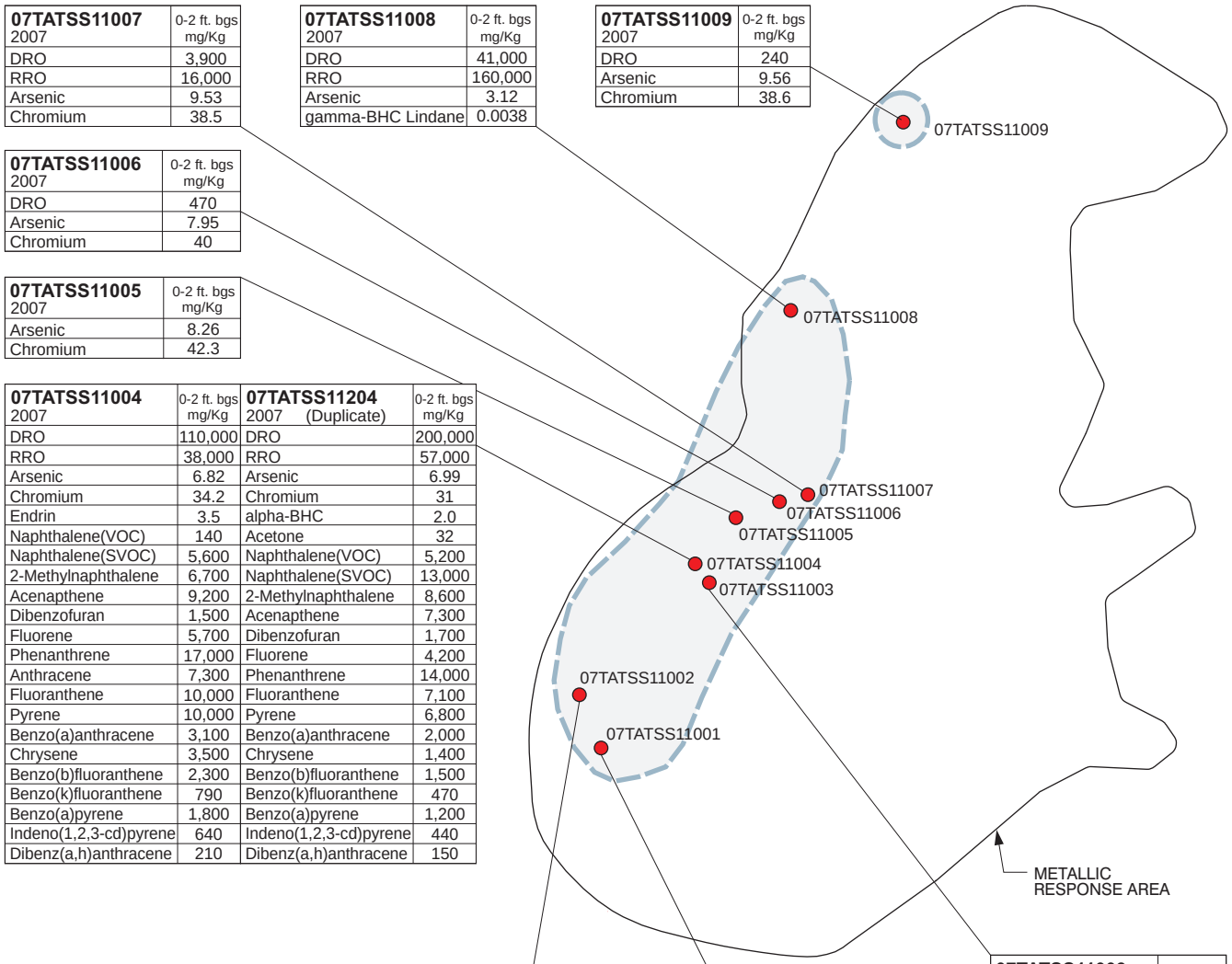

07TATSS11007 2007	0-2 ft. bgs mg/Kg
DRO	3,900
RRO	16,000
Arsenic	9.53
Chromium	38.5

07TATSS11008 2007	0-2 ft. bgs mg/Kg
DRO	41,000
RRO	160,000
Arsenic	3.12
gamma-BHC Lindane	0.0038

07TATSS11009 2007	0-2 ft. bgs mg/Kg
DRO	240
Arsenic	9.56
Chromium	38.6

07TATSS11006 2007	0-2 ft. bgs mg/Kg
DRO	470
Arsenic	7.95
Chromium	40

07TATSS11005 2007	0-2 ft. bgs mg/Kg
Arsenic	8.26
Chromium	42.3

07TATSS11004 2007	0-2 ft. bgs mg/Kg	07TATSS11204 2007 (Duplicate)	0-2 ft. bgs mg/Kg
DRO	110,000	DRO	200,000
RRO	38,000	RRO	57,000
Arsenic	6.82	Arsenic	6.99
Chromium	34.2	Chromium	31
Endrin	3.5	alpha-BHC	2.0
Naphthalene(VOC)	140	Acetone	32
Naphthalene(SVOC)	5,600	Naphthalene(VOC)	5,200
2-Methylnaphthalene	6,700	Naphthalene(SVOC)	13,000
Acenapthene	9,200	2-Methylnaphthalene	8,600
Dibenzofuran	1,500	Acenapthene	7,300
Fluorene	5,700	Dibenzofuran	1,700
Phenanthrene	17,000	Fluorene	4,200
Anthracene	7,300	Phenanthrene	14,000
Fluoranthene	10,000	Fluoranthene	7,100
Pyrene	10,000	Pyrene	6,800
Benzo(a)anthracene	3,100	Benzo(a)anthracene	2,000
Chrysene	3,500	Chrysene	1,400
Benzo(b)fluoranthene	2,300	Benzo(b)fluoranthene	1,500
Benzo(k)fluoranthene	790	Benzo(k)fluoranthene	470
Benzo(a)pyrene	1,800	Benzo(a)pyrene	1,200
Indeno(1,2,3-cd)pyrene	640	Indeno(1,2,3-cd)pyrene	440
Dibenz(a,h)anthracene	210	Dibenz(a,h)anthracene	150

07TATSS11002 2007	0-2 ft. bgs mg/Kg
DRO	1,100

07TATSS11001 2007	0-2 ft. bgs mg/Kg
DRO	54,000
RRO	140,000
Arsenic	6.42
Barium	3,680
Chromium	29.7
gamma-BHC Lindane	0.034

07TATSS11003 2007	0-2 ft. bgs mg/Kg
DRO	140,000
Arsenic	6.31
Chromium	40.6
Lead	462
gamma-BHC Lindane	0.031

LEGEND

- SURFACE SOIL EXCEEDING CLEANUP LEVELS
- AREA OF POTENTIAL SURFACE SOIL CLEANUP

bgs	BELOW GROUND SURFACE
DRO	DIESEL RANGE ORGANICS
ft	FEET
mg/Kg	MILLIGRAMS PER KILOGRAM
RRO	RESIDUAL RANGE ORGANICS

Notes:

1. Metallic Response Area was defined using a hand-held metal detector and defines the lateral extent of the zone where additional drums may occur.
2. No subsurface soil or groundwater samples were collected at SS011 due to the steep terrain, shallow bedrock, and soil type consisting of large cobbles.

NORTH
SCALE IN FEET
0 5 10 15

FIGURE 2-6

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ERP SITE SS011 ATTAINMENT AREA

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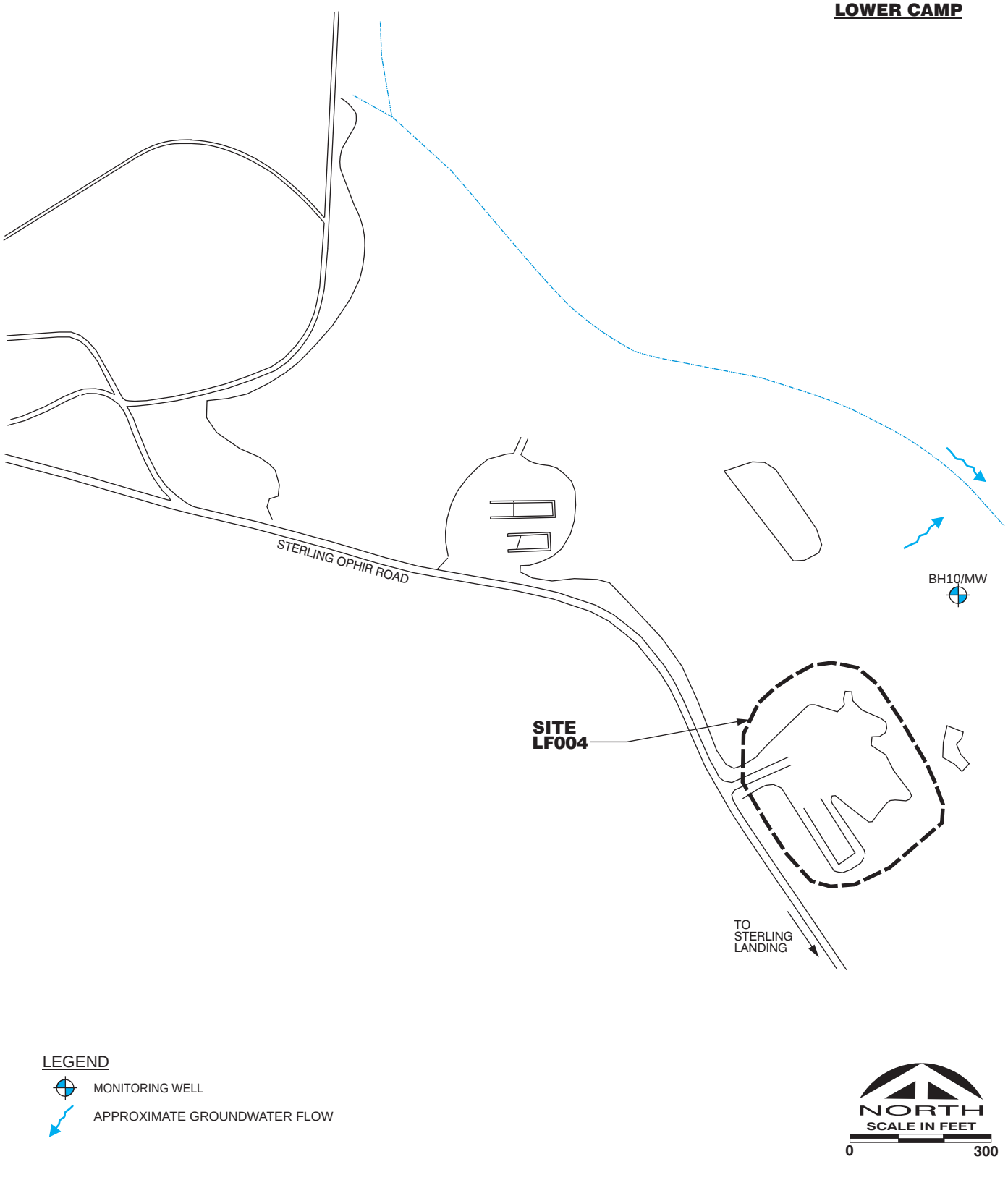

FIGURE 2-7

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ERP SITE LF004 ATTAINMENT AREA

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structures' former location. This source area also includes the old septic tank, located downhill from the POL Tank Farm area (SS003) at Lower Camp. During the years of operation, all drains from the Lower Camp facility were connected to this system.

- **Site SS011** is located west of Lower Camp and includes two collocated historical disposal areas: Hardfill No. 1 and WAA No. 1. Construction and demolition debris was disposed of in Hardfill No. 1, and approximately 150 drums were disposed of in WAA No. 1.
- **LF004** is located along the road to Sterling Landing and was used to bury wastes from the mid-1990s to around 2000.

2.3 COMMUNITY PARTICIPATION

NCP Section 300.430(f)(3) establishes a number of public participation activities that the lead agency must conduct following preparation of the Proposed Plan and review by the support agency. Components of these items and documentation of how each component was satisfied for ERP Sites SS003, SS008, SS011, and LF004 are described in **Tables 2-1** and **2-2**.

The Air Force received no comments on the Proposed Plan during the public comment period as stated in the Responsiveness Summary, which is provided as Section 3 of the ROD.

2.4 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As with many large sites, the environmental problems at Tatalina LRRS are complex. As a result, the Air Force, with concurrence from ADEC, has organized the environmental restoration work at Tatalina LRRS into 12 Operable Units (OUs) as follows:

- DP005 – Hardfill No. 2 and Morrison Knudsen Construction Camp Debris Area and Northeast Landfill
- LF004 – Lower Landfill No. 2
- LF010 – WAA No. 2 (Upper and Lower) and Upper Landfill No. 1
- OT006 – Airstrip
- OT012 – WACS Site
- SS001 – Minimally Attended Radar (MAR) Site
- SS002 – Spill No. 8, Truck Fill Stand (Sterling Landing)
- SS003 – POL Tank Farm
- SS007 – WAA No. 3
- SS008 – WAA No. 4, Old Sanitary Sewer System, Former Sewage Lagoon, and Former Paint Shop
- SS009 – Truck Fill Stand
- SS011 – Hardfill No. 1 and WAA No. 1

Table 2-1 Public Notification of Document Availability

Requirement:	Satisfied by:
Notice of availability of the Proposed Plan and RI/FS must be made in a general circulation major local newspaper.	Notice of availability was published in the *Tundra Drums* and the Legal Section of the *Fairbanks Daily News-Miner*. A public service announcement (PSA) was also aired on KSKO radio in McGrath.
Notice of availability must include a brief abstract of the proposed plan which describes the alternatives evaluated and identifies the preferred alternative (NCP Section 300.430(f)(3)(i)(A)	Notice of availability included all of these components and is included for reference as Appendix A to this ROD.
Notice of availability should consist of the following information: • Site name and location • Date and location of public meeting • Identification of lead and support agencies • Alternatives evaluated in the detailed analysis • Identification of preferred alternative • Request for public comments • Public participation opportunities including: – Location of information repositories and Administrative Record file – Methods by which the public may submit written and oral comments, including a contact person – Dates of public comment period – Contact person for the community advisory group (e.g., Restoration Advisory Board), if applicable	

Key:
NCP – National Contingency Plan
RI/FS – Remedial Investigation/Feasibility Study
ROD – Record of Decision

Table 2-2 Public Comment Period Requirements

Requirement:	*Satisfied by:*
Lead agency should make document available to public for review on same date as newspaper notification.	Document was made available to the public on May 7, 2012. The notification of availability was made on May 6, 2012, in the *Fairbanks Daily News-Miner* and on May 14, 2012, in the *Tundra Drums*.
Lead agency must ensure that all information that forms the basis for selecting the response action is included as part of the Administrative Record file and made available to the public during the public comment period.	Joint Base Elmendorf-Richardson maintains the Administrative Record file for ERP Sites SS003, SS008, SS011, and LF004. All data collected and all CERCLA primary documents produced for ERP Sites SS003, SS008, SS011, and LF004 are maintained as part of this file at http://www.adminrec.com, which is available to the public.
CERCLA Section 117(a)(2) requires the lead agency to provide the public with a reasonable opportunity to submit written and oral comments on the Proposed Plan. NCP Section 300.430(f)(3)(i) requires the lead agency to allow the public a minimum of 30 days to comment on the RI/FS and the Proposed Plan and other supporting information located in the administrative record and information repository.	The Air Force provided a public comment period for the RI/FS and the Proposed Plan from May 7, 2012, to June 6, 2012. The Proposed Plan in included in Appendix B.
The lead agency must extend the public comment period by at least 30 additional days upon timely request.	The Air Force received no requests to extend the public comment period.
The lead agency must provide the opportunity for a public meeting to be held at or near the site during the public comment period. A transcript of this meeting must be made available to the public and be maintained in the Administrative Record and information repository for the site (pursuant to NCP Section 300.430(f)(3)(i)(E)).	The Air Force received no requests to hold a public meeting.

Key:
Air Force – U.S. Air Force
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
ERP – Environmental Restoration Program
NCP – National Contingency Plan
RI/FS – Remedial Investigation/Feasibility Study

This decision document addresses the following sites and OUs:

- SS003 – POL Tank Farm
- SS008 – WAA No. 4, Old Sanitary Sewer System, Former Sewage Lagoon, and Former Paint Shop
- SS011 – Hardfill No. 1 and WAA No. 1
- LF004 – Lower Landfill No. 2

The remaining eight sites are in various stages of the CERCLA process and are addressed in other documents.

2.5 SITE CHARACTERISTICS

2.5.1 Physiography and Climate

Tatalina LRRS has a cold, continental climate with extreme temperature differences. Winters are long, cold, and dry, and summers are short. Winter temperatures range from -42 to 0 degrees Fahrenheit (ºF), and the average temperature in December is -15°F. Summer temperatures range from 42°F to 80°F, and average 50°F to 60°F. The Takotna River is generally ice-free from June through October. The average annual total precipitation is 15 inches, with 84 inches of snowfall.

2.5.2 Geology

The geology of Tatalina LRRS and Lower Camp are summarized in the following subsections. A more detailed description of the geologic setting in the vicinity of Tatalina LRRS is provided in the Final Remedial Investigation (RI) Report (USAF, 1998b).

2.5.2.1 Local Geology

Tatalina LRRS is located on the eastern flank of the Kuskokwim Mountains of the Western Alaska physiographic province. The most widespread lithologic unit surrounding Tatalina LRRS is the sedimentary Upper Cretaceous Kuskokwim Group, which consists of greywacke, shale, quartz-rich sandstone, and conglomerates. The most prominent structural feature in the Tatalina area is the right, lateral, northeast-trending Iditarod-Nixon Fork Fault. The structural grain of the Tatalina area is northeast trending, and many of the drainages are probably fault controlled (USAF, 1998b). Tatalina LRRS is located in a zone characterized by discontinuous permafrost. Neither seasonally frozen material nor permafrost was logged in the 1997 RI at Lower Camp. Permafrost was encountered starting at depths of 34 feet in two wells drilled during the 1997 RI at Sterling Landing (USAF, 1998b).

2.5.2.2 Lower Camp Geology

Lower Camp, on the southern flank of Takotna Mountain, is at an elevation of about 1,250 feet. The Airstrip is about 2 miles southeast of Lower Camp, at an elevation of about 890 feet. Both Lower Camp and the Airstrip are on the same relatively broad, flat-topped ridge that slopes

gently southeast. Lower Camp rests on up to 30 feet of alluvium and talus capping fractured interbedded sandstone, siltstone, shale, and hornfels. Surficial sediments are dense, and the backhoe used during RI excavations could not penetrate more than 5 feet bgs in some areas (USAF, 1998b). A low-permeability clay layer is present in some areas.

2.5.3 Hydrogeology

The Upper Camp of Tatalina LRRS is the principal recharge zone for groundwater at the installation. Water collects downslope into shallow aquifers and surface streams. Drinking water for the installation is collected from one such surface stream through an infiltration gallery adjacent to SS008. Groundwater at Upper Camp may occur in the sediments seasonally as perched water, but discharge of run-off into bedrock or downslope is more likely.

Groundwater at Lower Camp is found primarily in the more permeable sediments at depths that range from 8 to 28 feet bgs. Because of the relatively steep terrain, ravines that define surface drainage patterns also contain the unconsolidated material through which groundwater flows. Soil is generally too thin for saturated conditions in the subsurface along the ridges.

During the 1997 RI at Tatalina LRRS, the following observations were recorded:

- Groundwater was encountered at Lower Camp at minimum depth of 10 feet bgs.
- The saturated soil depth varied from 0 to 15 feet bgs.
- Groundwater flow was interpreted to follow the contours of the top of a low-permeability clay horizon and bedrock, with localized gradients.
- Groundwater was encountered in the vicinity of the infiltration gallery and the creek topographically upgradient of SS008.

The magnitude of seasonal groundwater fluctuations, potential changes in gradient, and aquifer thickness are not known.

2.5.4 Surface Water Hydrology

Various watersheds originate from Takotna Mountain. Surface waters present in Upper Camp and other regions flow into the various stream channels and major drainages within the watersheds. Surface water flows from rain events are intermittent, while water flows from snow melts can occur for longer periods. There are two main surface water drainages flowing toward the Tatalina River that could be affected by LRRS activities. One drainage extends from the south side of the mountain and another extends from the southeastern side of the mountain. Ridges separate these two major drainages. The drainage originating from the southeastern side passes through the eastern border of Lower Camp, continues on the northern side of the ridge, and eventually enters the Tatalina River. The other drainage, originating from the southern region west of Lower Camp, passes through the south side of Lower Camp, merges with another creek from the northern watershed, and eventually enters the Tatalina River (USAF, 1998b).

2.5.5 Ecology

The flora, fauna, and threatened and endangered species occurring in and around Tatalina LRRS are discussed in the following subsections.

2.5.5.1 Flora

This subsection summarizes the prevalent floral species that occur in and around Tatalina LRRS. The predominant habitat at Tatalina LRRS is upland spruce/hardwood forest, which is characterized by white spruce with scattered paper birch. Quaking aspen is found on moderate south-facing slopes and black spruce is found on northern exposures and poorly-drained flat areas. The understory within the forest consists of spongy mosses and low brush on the cool moist slopes, grasses on dry slopes, and willow and alder with dwarf birch in the high, open forests near timberline. Common shrubs are willow, highbush cranberry, and rose. Common herbs are bluebell, fireweed, lupine, and twinflower. Two common grasses are blue-joint reed grass and cottongrass. Sedges and rushes, as well as various ferns, mosses, and lichens, are common in moist areas (USAF, 1998b).

Some special status plants may occur in the general area of McGrath, which includes the Tatalina LRRS area. The Alaska National Heritage Program Database identifies the following plant species that might occur in the McGrath area and are considered rare or are of special interest: *Smelowskia pyriformis*, Hudson Bay sedge (*Carex heleonastes*), Alaska sweetflower rockjasmine (*Androsace chamaejasme Wulfen*), and Arctic pennycress (*Noccaea arctica*) (USAF, 1998b). However, none of these plant species were actually observed at Tatalina LRRS during previous RI ecological surveys or site visits (USAF, 1998b).

2.5.5.2 Fauna

The prevalent faunal species that occur in and around Tatalina LRRS are summarized below. Information is presented for resident and migratory mammals, birds, amphibians/reptiles, and aquatic species. Information is provided for potentially occurring or observed mammals, birds, amphibians/reptiles, and aquatic species that inhabit or migrate through Tatalina LRRS, as well as those flora and fauna specifically noted in the 17 to 19 June 1997 ecological survey (USAF, 1998b).

Mammals. Tatalina LRRS falls within the general range of many species of wildlife. Some of the more common mammals include: moose, caribou, brown bear, black bear, gray wolf, beaver, wolverine, and marten. Many smaller mammals, including muskrat, snowshoe hare, weasels, and voles, are also common (USAF, 1998b). Trapping and hunting, specifically of beaver, are common subsistence practices within the McGrath area (USAF, 1998b).

Birds. Shrub thickets at the Tatalina LRRS, particularly associated with water and riparian habitat, provide diverse vegetative structure and high productivity that has been correlated with breeding bird abundance, density, and species diversity. Spruce grouse, ruffed grouse, sharp-tailed grouse, and rock and willow ptarmigan inhabit the area. Many passerine species and a few

raptor species live within the Tatalina LRRS area year-round, including robins, raven, gray jay, chickadees, dark-eyed junco, thrushes, falcons, and red-tailed hawk (USAF, 1998b).

Some of the more common waterfowl that nest or migrate through the Tatalina LRRS area, specifically within the floodplain of the Kuskokwim River, include: American widgeon, mallards, green-winged teal, northern pintail ducks, Canada geese, white-fronted geese, snow geese, gulls, and loons. The Tatalina area also provides habitat for a variety of migratory shorebirds such as spotted sandpiper, solitary sandpiper, and semipalmated plover (USAF, 1998b).

Amphibians/Reptiles. The only amphibian species potentially occurring in or around the Tatalina LRRS is the wood frog (*Rana sylvatica*) (Table 1-4; USBLM, 2001).

Aquatic Species. Fish species known to occur in streams within the Tatalina LRRS area include: Coho, Chinook, chum, pink, and sockeye salmon; whitefish; sheefish; northern pike; Arctic grayling; Arctic char; and Dolly Varden (USAF, 1998b).

2.5.5.3 Threatened and Endangered Species

No threatened or endangered plant, fish, or wildlife species are known to occur within Tatalina LRRS.

2.5.5.4 Tatalina Areas of Critical Concern and Alaska Special Areas

The U.S. Bureau of Land Management (BLM) recognizes the Iditarod National Historic Trail as an Alaskan Special Area (USBLM, 2007). This is a trail that celebrates a 2,400-mile system of winter routes that first connected ancient Native villages. The primary route of the Iditarod Trail runs directly through both McGrath and Takotna, but does not run through Tatalina LRRS.

The BLM denotes Areas of Critical Environmental Concern to identify sensitive and valuable aquatic resources that require special management. The BLM does not currently recognize any Areas of Critical Environmental Concern within Tatalina LRRS or nearby areas. Additionally, crucial or critical habitats have not been identified for aquatic or terrestrial species in the vicinity of Tatalina LRRS.

2.5.6 Previous Site Characterization Activities

2.5.6.1 ERP Site SS003

Preliminary Site Investigation Activities at SS003

Prior to the 1997 RI, the 611th Civil Engineering Squadron cleaned and removed out-of-service aboveground storage tanks from the POL Tank Farm. Three bulk diesel storage tanks and two bulk MOGAS storage tanks were removed (USAF, 1993). The tank removal project did not investigate or remove soil or the liner within the POL Tank Farm bermed areas. Three remaining aboveground storage tanks are currently used for diesel and MOGAS storage and dispensing at Tatalina LRRS.

Site records indicate that the POL Tank Farm bermed area was previously drained. Water, potentially containing PHCs, was released into the top of the drainage area that begins just below the POL Tank Farm pad. Four fuel spills, which occurred between 1970 and 1982, are also listed in site records (USAF, 2004). Records indicate that a liner was installed in the bermed POL Tank Farm area in 1983 (USAF, 2004).

RI Activities at SS003

1997 RI. During the 1997 RI, one seep and sediment location, two surface soil locations, and three soil boring/monitoring wells (BH1-MW, BH12-MW, and BH20-MW) were sampled to investigate the potential release of contaminants from the POL Tank Farm. A "seep" is defined as surface water by ADEC and regulated in accordance with 18 AAC 70 Water Quality Standards. Borings for the three monitoring wells were drilled at progressively greater distances along the surface drainage, downgradient from the POL Tank Farm (USAF, 1998b).

The 1997 RI report concluded that the analytical data suggests that fuel leaks/spills infiltrated vertically in the POL Tank Farm area until reaching the groundwater interface, and then spread horizontally (USAF, 1998b).

2002 Follow-on RI. In 2002, 12 shallow borings were drilled inside the bermed POL Tank Farm area and into the berms to assess potential impacts of past spills on soil on top of the liner. One additional boring and five monitoring wells (BH/MW02-8, BH/MW02-9, BH/MW02-21, BH/MW02-23, and BH/MW02-24) were installed downgradient of the POL Tank Farm to assess potential PHC migration. The 2002 RI follow-on report confirmed conclusions made as part of the 1997 RI. Shallow soil concentrations within the bermed areas contained the greatest PHC concentrations and soil located a short distance downgradient of the POL Tank Farm contained moderate concentrations. However, the migration pathway appears to have been near the ground surface rather than through vertical infiltration followed by horizontal migration along the groundwater interface as stated in the 1997 RI (USAF, 1998b).

2003 Follow-on RI. Five surface soil samples were collected from within the POL Tank Farm bermed area to further characterize the contaminant source. Groundwater samples were collected from the eight existing monitoring wells. Monitoring data collected during the 2003 RI supported findings of the previous investigations that contaminated soil in the POL Tank Farm was a continuing source of contamination of groundwater downgradient of the tank farm (USAF, 2004). The Follow-on RI Report recommended continued monitoring in 2004, along with removing the secondary containment berms, foundations of the former POL Tank Farm impoundments, and associated liner material to fully characterize the site.

2004 Follow-on RI. Based on the recommendations of the 2003 Follow-on RI, monitoring activities during the 2004 Follow-on RI (USAF, 2005) included removing the liner material from Tank Pit 1 and Tank Pit 2/3. Soil samples were collected from 10 test pits to evaluate contaminant source and migration. Two test pits were excavated in Tank Pit 1, three in Tank Pit 2/3, four in areas immediately adjacent to and topographically downgradient of the tank pits, and one upgradient of the tank pits. Groundwater samples were collected from seven of the eight existing monitoring wells. MW02-8 was dry; therefore, a sample could not be collected. Monitoring data collected during the 2004 Follow-on RI indicated the presence of POL

contaminants in soil immediately below the tank pits and in an area downgradient of Tank Pit 1. No soil contamination was present immediately upgradient of the POL Tank Farm. Groundwater located downgradient from the POL Tank Farm contained POL contamination. The RI concluded that the soil and groundwater contamination at SS003 is attributed to historical spills at the POL Tank Farm.

2.5.6.2 ERP Site SS008

Preliminary Site Investigation Activities at SS008

A site investigation was conducted at SS008 WAA No. 4 in 1992 (USAF, 1993). During the 1992 site investigation, three surface and three collocated subsurface soil samples were collected from WAA No. 4 and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/PCBs, and metals. Compounds detected in these samples included: toluene, ethylbenzene, xylenes, 1,2,4-trichlorobenzene, pesticides/PCBs, and metals (USAF, 1993).

During the 1997 RI, an area including the sampling locations from the 1992 site investigation was excavated. Therefore, these data were not used in the Final RI Report (USAF, 1998b).

RI Activities at SS008

1997 RI. A RI was conducted in 1997 to estimate the extent of potential contamination at SS008 and assess the impact of historical releases on lower pad drainage, confirm the absence or presence of groundwater, and define the nature of groundwater contamination and flow characteristics.

RI activities in 1997 included six soil borings (BH2/MW, BH3/MW, BH4, BH6, BH7, and BH8) located on the eastern periphery of Lower Camp next to support facilities. Borings BH2, located next to the infiltration gallery, and BH3, located along the creek, were completed as monitoring wells. Two test pits were dug near the old truck fill stand. One seep and sediment sample was collected along the creek from a location downgradient of Lower Camp.

1999 Underground Storage Tank (UST) Closure Activities. During the 1987 demolition activities at Lower Camp, five ADEC-registered USTs in the vicinity of SS008 were removed. This removal did not include submittal of an application for tank closure with ADEC. In 1999, the former footprints of the USTs were re-located, excavated, and field screened to determine if contamination existed. Closure reports for all five USTs were submitted to ADEC in December 1999 (USAF, 1999a, 1999b, 1999c, and 1999d). The Air Force concluded that PHC contamination was present in soil around the former footprints of ADEC USTs 769-2, 769-5, and 769-6, located next to the truck fill stand.

1999 Follow-on RI. The 1999 RI was intended to document the extent of DRO contamination around boring location BH8, located near the truck fill stand at SS008. Sampling activities were conducted at three borings (BH21, BH37-MW, and BH38). BH37-MW was located northeast and downgradient of the truck fill stand, was completed as a monitoring well. BH21 and BH38 were located southeast of the truck fill stand. Two surface water and sediment samples were

collected from within the creek east and downgradient from the Lower Camp pad area (USAF, 2000b). This was the same location compared to the 1997 RI.

Sampling results indicated the presence of DRO in surface soil from Boring BH21. Samples from all other borings located near the truck fill station were non-detect for DRO, gasoline range organics (GRO), and residual range organics (RRO). Antimony, arsenic, chromium, nickel, and one PCB (Aroclor 1260) were also detected in the soil samples above ADEC cleanup levels. A 0.17-foot-thick layer of floating product with a petroleum odor was found on top of the groundwater in BH37-MW. The product was removed during well development before groundwater was sampled. DRO, beryllium, cadmium, chromium, lead, nickel, and zinc were detected in the sample from Monitoring Well BH37-MW.

DRO, GRO, and RRO concentrations in the surface water and sediment samples in 1999 ranged from very low to non-detect.

2002 Follow-on RI. To evaluate the extent of the floating product encountered in Monitoring Well BH37-MW, located northeast of the truck fill stand at SS008, additional groundwater monitoring was conducted during 2002. Six monitoring wells (BH/MW02-25 through BH/MW02-30) were installed, along with one new borehole (BH02-31).

A total of 0.4 inches of free product was encountered in Monitoring Well BH37-MW. Wells located within 100 feet of BH37-MW did not contain detectable levels of DRO, suggesting the free product might be localized in this area. The 2002 RI report indicated that the fuel plume appears to be confined to the site or toe of the slope of the hill that housed the old power plant and the new and existing monitoring wells. The stream north of the well adequately defined the contaminant plume and would provide an excellent method of monitoring any migration or attenuation of the fuel plume (USAF, 2003).

2003 Follow-on RI. Monitoring for migration and attenuation of contaminants at SS008 was conducted in the 2003 Follow-on RI. A groundwater sample was collected from the nine existing monitoring wells. Similar to the findings of the 2002 RI, approximately 0.4 inches of free product was found in Monitoring Well BH37-MW. However, based on the monitoring results of surrounding wells, it was concluded that the free product may be isolated in this area. The 2003 RI recommended further monitoring in 2004, along with passive free product recovery in Monitoring Well BH37/MW (USAF, 2004).

2004 Follow-on RI. Monitoring continued at SS008 during the 2004 Follow-on RI. Groundwater samples were collected from the nine existing monitoring wells. The detection of DRO at BH/MW02-29 in 2004 was the first exceedence in this particular well, and most likely represented migration downgradient from Monitoring Well BH37-MW where free product was discovered. Similar to the previous Follow-on RIs, approximately 0.4 inches of free product was found in Monitoring Well BH37-MW (USAF, 2005).

2.5.6.3 ERP Site SS011

Preliminary Site Investigation Activities at SS011

A site investigation was conducted at SS011 WAA No. 1 in 1992 (USAF, 1993). During the 1992 site investigation, three surface and three collocated subsurface soil samples were collected and analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Compounds detected in these samples included trichloroethene, polynuclear aromatic hydrocarbons (PAHs), pesticides/PCBs, and metals (USAF, 1993).

During the 1997 RI, the area including the sampling locations from the 1992 site investigation was excavated. Therefore, these data were not used in the Final RI Report (USAF, 1998) and will not be used in this document.

RI Activities at SS011

1997 RI and Removal Action. During 1997, the Air Force conducted a removal action along with a RI at SS011. As part of the removal action, most of the waste drums located at WAA No. 1 were removed. Confirmation sampling was performed at the drum storage locations and indicated that neither PCBs nor total petroleum hydrocarbons were present above ADEC soil cleanup levels (USAF, 1998a).

As part of the 1997 RI, soil samples collected from two test pits located downgradient of Hardfill No. 1 and WAA No. 1 to determine contaminant migration indicated the presence of VOC and pesticide contaminant residues in soils at trace levels.

During the RI field work, approximately five to 10 additional drums were found partially buried on a steep slope immediately west and below the two test pits, downslope from the WAA No. 1 drum removal area. Soil samples, one surface and one subsurface, were collected directly under one of the partially-buried drums to determine if the drums could have potentially released any contaminants. Sampling results indicated a higher contaminant concentration in the shallow subsurface sample than the surface sample.

The 1997 RI report indicated that, due to the limited sampling conducted during the RI for the drum disposal area downgradient of SS011, the nature and extent of contamination was not well understood (USAF, 1998b). Additional monitoring of the area, including collecting additional shallow subsurface soil samples, along with seep samples collected at a downgradient location, was recommended.

2002 Follow-on RI. In 2002, three collocated sediment and surface water samples were collected downgradient of the slope at SS011. The 2002 Follow-on RI recommended additional monitoring at this location (USAF, 2003).

2003 Follow-on RI. During the 2003 RI work at SS011, three additional sediment and surface water samples were collected from the drainage water seeps downgradient of the slope. During the 2003 RI, there was no evidence of PHC contamination in surface water or sediment downgradient from the buried waste drums (USAF, 2004). During the sampling efforts, 10 to 20 partially-buried drums were observed in this area. Following the 2003 RI, no additional

monitoring was recommended; however, it was recommended that all the waste drums be removed to prevent potential future contamination.

2004 Follow-on RI. In 2004, RI work at SS011 consisted of soil sampling, waste drum removal, and exploration for further locations of buried waste drums. Six partially-buried waste drums were removed from the slope. Five of the drums were empty; however, one waste drum contained less than 5 gallons of a material suspected to be diesel fuel. A magnetic tool was used to locate a 30-foot by 100-foot area of the slope where additional waste drums were potentially buried.

Five surface soil samples were collected from the area directly downgradient of the slope where waste drums were exposed and removed. One sample at SS011 (Sample SS003) had concentrations of PAHs detected at higher concentrations than the other samples. Detected concentrations in Sample SS003 represented a local hotspot, because surrounding locations were orders of magnitude lower. The 2004 Follow-on RI determined that locating the remaining drums, quantifying the area extent of buried materials, and mapping them would be necessary to properly characterize SS011 (USAF, 2005).

2007 Follow-on RI. The 2007 Follow-on RI involved mapping the area of potentially-buried drums using a magnetometer coupled with a high accuracy global positioning system (GPS). The extent of potentially-buried debris registering a magnetic signal at SS011 was approximately 2,500 square feet. Depending on the distribution and orientation of the potentially-buried debris (i.e., vertical, horizontal, or stacked), and presuming the 2,500 square feet is entirely drums, the area may contain up to 400 to 500 drums if tightly packed.

Ten exposed drums on the down slope side of the area identified by magnetic anomaly were noted. The drums were numbered sequentially from South to North, 1 through 10. Of these, all 10 drums had evidence of stained soils beneath them where their contents had previously leaked. Drum Number 4 could not be accessed for sampling. None of the 10 drums observed were currently leaking and they were, to the best of the field teams observations, noted to be empty. All 10 drums were partially-buried in the surrounding hillside, approximately 50 percent or more, and could not be extricated by hand.

Ten surface soil samples were collected from beneath exposed drums that showed signs that they had leaked their contents in the past. Based on the laboratory results, it is likely that the buried drums contained diesel fuel, used oil, solvents, pesticides, and herbicides (USAF, 2008a).

2.5.6.4 ERP Site LF004

1997 RI. In 1997, one soil boring was drilled and completed as a monitoring well at LF004. Subsurface soil and groundwater samples were collected from this boring. Seep and sediment samples were collected from a downgradient drainage creek. All detected contaminants were below human health risk-based levels. Three chemicals of ecological concern (COECs) were identified in an ecological risk assessment: 4,4'-dichlorodiphenyldichoroethylene (DDD), 4,4'-dichlorodiphenyldichloroethane (DDE), and 4,4'-dichlorodiphenyltrichloroethane (DDT). Levels of these pesticides were below soil cleanup levels and represent residual pesticides from historical, legal applications at the installation (USAF, 1998b).

1999 Closure Evaluation. In 1999, one surface water sample was collected at the same location as 1997. Three test holes were excavated into the cover of the landfill to verify the cover is at least 2 feet deep. No waste was encountered in any of the test holes. A small amount of exposed concrete and construction debris was visible along the toe of the landfill and was recommended to be covered (USAF, 2000a).

2.5.7 Nature and Extent of Contamination

This section establishes that there is evidence of contamination remaining above regulatory cleanup levels for unrestricted use at the four ERP sites by comparing investigation results to the applicable regulatory cleanup levels. The regulatory framework establishing applicable cleanup levels is discussed below, followed by a summary of environmental investigation results for the four ERP sites addressed in this document.

2.5.7.1 Regulatory Framework

The State of Alaska has promulgated soil and groundwater cleanup levels in 18 AAC 75 *Oil and Hazardous Substances Pollution Control Regulations* (ADEC, 2008b). Surface water standards are provided in in 18 AAC 70 *Water Quality Standards* (ADEC, 2008a). These regulations are discussed below.

Soil. ADEC 18 AAC 75.340 provides four methods that may be used for developing soil cleanup levels. Method One applies only to petroleum contamination. Method Two applies to both petroleum and non-petroleum contamination and is generally applicable at all contaminated sites in Alaska, unless use of Method Three or Method Four cleanup levels is specifically approved. Method Three allows development of site-specific cleanup levels using standard equations provided in ADEC guidance. Method Four allows development of risk-based cleanup levels from a site-specific risk assessment.

The tabulated soil cleanup levels provided 18 AAC 75.341 Method Two, Tables B1 and B2, Soil Cleanup Levels (Under 40-Inch Zone) (hereinafter referred to as ADEC Method Two cleanup levels) are protective of human health and the environment, allow for unlimited use and unrestricted exposure, and are appropriate for use at Tatalina LRRS.

Groundwater. ADEC groundwater cleanup levels are listed in 18 AAC 75.345. Specific values are listed in 18 AAC 75.345, Table C for groundwater that is, or may be, used as a drinking water source. Alternatively, groundwater cleanup levels can be derived from a site-specific risk assessment, subject to ADEC approval.

Surface Water. Surface water criteria provided in 18 AAC 70 are protective of human health (water supply and water recreation use) and the environment (aquatic life and wildlife propagation).

Sediments. With respect to cleanup levels, sediments are distinguished from soil by the degree to which they are submerged in water. The substrate in wetlands or streambeds that is submerged more than half of the year is considered sediment; the substrate in areas that are never or only occasionally submerged is considered soil.

Although there are no sediment cleanup levels established in regulation, Alaska water quality regulations state that sediment contamination may not cause adverse effects on aquatic life. Therefore, sediment sample results were screened against Threshold Effects Level and Probably Effects Level values, as published in the National Oceanic and Atmospheric Administration Screening Quick Reference Tables.

2.5.7.2 ERP Site SS003

Environmental studies were conducted at SS003 in 1997, 2002, 2003, and 2004 to characterize the nature and extent of contamination resulting from the POL Tank Farm. The studies included collected soil, groundwater, surface water, and sediment samples for laboratory analysis.

Notable observations include a 1997 finding that fuel leaks/spills infiltrated vertically in the POL Tank Farm area until reaching the groundwater interface, and then spread horizontally. The 2002 investigation confirmed that shallow soil concentrations within the bermed areas contained the greatest PHC concentrations; while soil located a short distance downgradient contained moderate concentrations. The 2003 investigation confirmed contaminated soil in the POL Tank Farm was a continuing source of contamination of groundwater downgradient of the tank farm. In addition, after the removal of the liner in 2004, POL contaminants were still present in the soil immediately below the tank pits and in the downgradient soil and groundwater.

DRO concentrations in the soil samples ranged from not detected to 38,000 milligrams per kilogram (mg/Kg), with a cleanup level of 1,000 mg/Kg. The source of this DRO contamination was described in the 1997 RI report to be an isolated incident, with a separate, non-pervasive spill source. The subsurface soil pathway is incomplete and was not further considered.

Potential risks posed by these contaminants at SS003 were evaluated in a risk assessment conducted in 2009 and are discussed in Section 2.7.

2.5.7.3 ERP Site SS008

Environmental studies were conducted at SS008 in 1997, 1999, 2002, 2003, and 2004 to characterize the nature and extent of contamination resulting from storage of waste oil drums. The studies included collected soil, groundwater, surface water, and sediment samples for laboratory analysis.

Eleven boreholes were completed in 1997 and 1999. Only two had PCB contamination. PCBs were detected above the ADEC Method Two cleanup level of 1 mg/Kg in the surface soil of Boring BH-21 and subsurface soil of Boring BH-8. PCB results for this site ranged from non detect to 17 mg/Kg. PCE was detected in one sediment sample at 0.294 mg/Kg, but not in neighboring boreholes or monitoring wells. The ADEC Method Two cleanup level for PCE is 0.024 mg/Kg. Most notably, one monitoring well had free product during the 2002, 2003, and 2004 investigations. The 2002 and 2003 reports concluded that the free product was limited and confined to the base or toe of the slope of the hill. In 2004, DRO was detected in a monitoring well downgradient from the well with free product, most likely representing migration of

contaminants. DRO results ranged from not detected to 2.1 milligrams per liter (mg/L), with an ADEC Table C cleanup level of 1.5 mg/L.

Breakdown products from pesticides were detected above ADEC Method Two cleanup levels; however, these pesticides are present due to legal application throughout the installation and, therefore, are not considered for remediation. The subsurface soil pathway is incomplete and is not considered further.

Potential risks posed by these contaminants at SS008 were evaluated in a risk assessment conducted in 2009 and are discussed in Section 2.7.

2.5.7.4 ERP Site SS011

Environmental studies were conducted at SS011 in 1997, 2002, 2003, 2004, and 2007 to characterize the nature and extent of contamination resulting from storage of drums. The studies included collected soil, groundwater, surface water, and sediment samples for laboratory analysis.

The 1997 report indicated neither PCBs nor PHCs were present above ADEC Method Two cleanup levels (USAF, 1998b). The 2003 report indicated there was no evidence of PHC contamination in surface water or sediment downgradient from the buried waste drums. In 2004, surface samples downgradient of the slope where waste drums were exposed and removed had RRO results ranging from 2,300 to 32,000 mg/Kg; and DRO results ranged from 420 to 11,000 mg/Kg. The ADEC Method Two Cleanup level is 11,000 mg/Kg for RRO and the site-specific cleanup level for DRO is 1,000 mg/Kg. One sample had PAHs detected at higher concentrations than the other samples, representing a hotspot (USAF, 2005).

Ten partially-exposed drums were documented in 2007 and remain on site, and a magnetometer coupled with a high accuracy GPS was used to determine the potential extent of possible buried drums. The extent of potentially-buried debris registering a magnetic signal was approximately 2,500 square feet. Surface soils collected from the stained area beneath the 10 drums had results for DRO ranging from 240 to 200,000 mg/Kg, while RRO results ranged from 700 to 160,000 mg/Kg. No subsurface soil or groundwater samples were collected at SS011 due to the steep terrain, shallow bedrock, and soil type consisting of large cobbles.

Potential risks posed by these contaminants at SS011 were evaluated in a risk assessment conducted in 2009 and are discussed in Section 2.7.

2.5.7.5 ERP Site LF004

Between 1992 and 1999, three RIs were conducted at LF004. No COCs were detected above ADEC cleanup levels for surface soil, subsurface soil, groundwater, or downgradient surface water and sediment samples. The 1997 RI did not investigate the active portions of the landfill. One soil boring was drilled and converted to a monitoring well, and then sampled for subsurface soil and groundwater. Benzene, pesticides, and benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected below ADEC cleanup levels in the soil boring and groundwater. In 1999,

test holes were excavated into the cover of the landfill to verify that it was at least 2 feet thick. Breakdown products were detected from pesticides.

Potential risks posed by these contaminants at LF004 were evaluated in a risk assessment conducted in 1997 and are discussed in Section 2.7.

2.5.8 Conceptual Exposure Model

A conceptual exposure model (CEM) was developed to depict the potential relationship or exposure pathway between chemical sources and receptors. An exposure pathway describes the means by which a receptor (human or ecological) can be exposed to contaminants in environmental media. These pathways are presented on **Figures 2-8** through **2-13**, based upon current and reasonably likely future land uses and the potential beneficial use of groundwater and surface water at ERP Sites SS003, SS008, SS011. This level of detail was not provided in previous reports for LF004.

Since future residential land use is considered unlikely, it is not included in Figures 2-8, 2-10, and 2-12. However, residential land use has been considered in the human health risk assessment (HHRA) to determine whether the site would be suitable for unrestricted use or unlimited exposure and to establish requirements for land use controls, as described within this ROD. In addition to land use, other resources may be impacted, such as groundwater.

2.6 CURRENT AND POTENTIAL FUTURE LAND USE AND RESOURCE USES

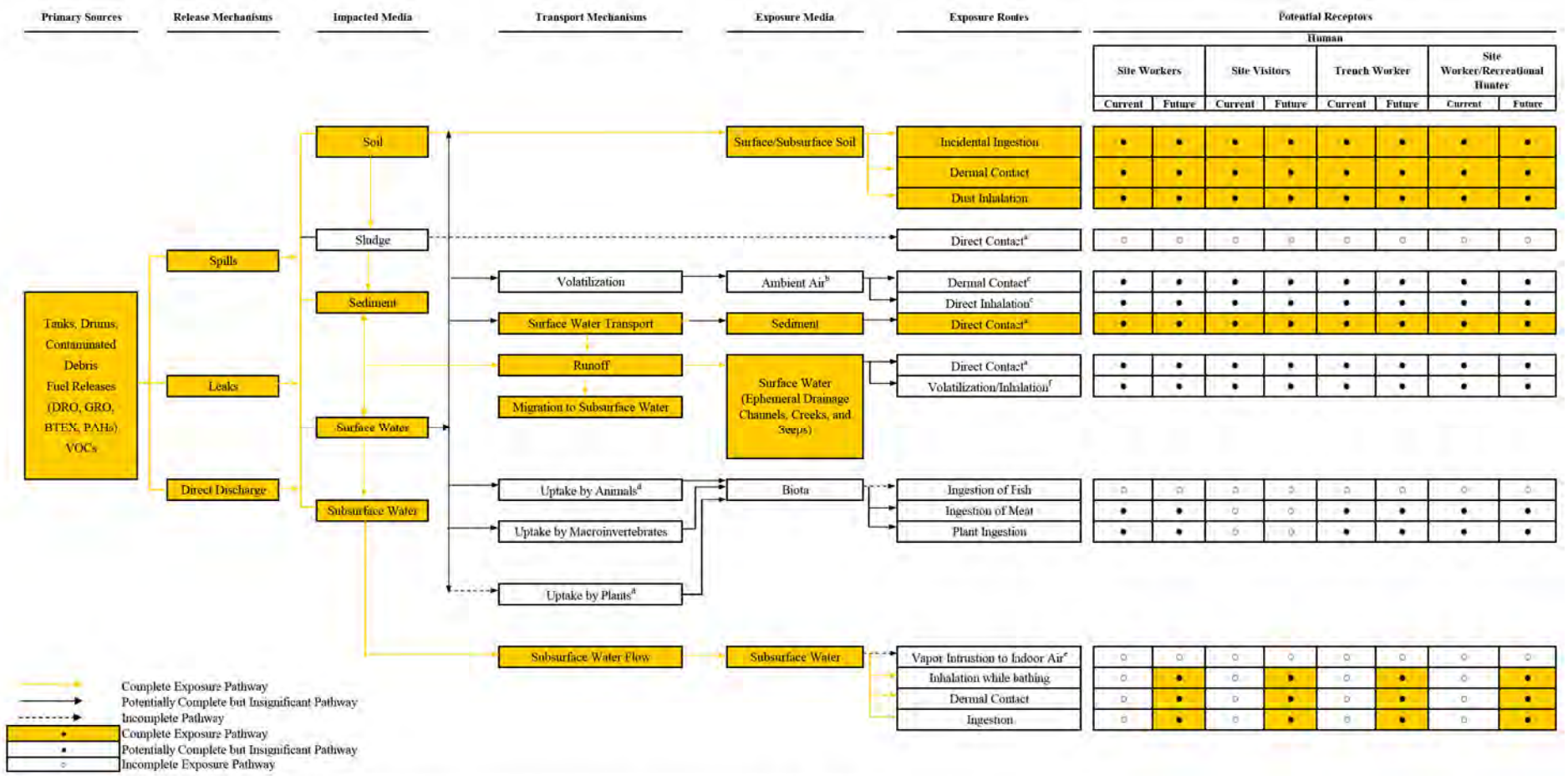
2.6.1 Land Use

The current land use of SS003, SS008, SS011, and LF004 is industrial with temporary residents. Tatalina LRRS is currently used as an active MAR facility. It contains one residential structure for approximately four year-round workers and additional seasonal workers. There is road access from nearby Takotna to Tatalina LRRS. Frequent use by community members is not anticipated; however, members of nearby villages use the surrounding lands and rivers for subsistence purposes.

As the lead agency, the Air Force has the authority to determine the future anticipated land use of SS003, SS008, SS011, and LF004. After considering input from ADEC, the Air Force has determined that the most likely indefinite future land use at these sites is consistent with current land uses. The Air Force plans to retain ownership of all property at Tatalina LRRS for the foreseeable future. This determination is made considering the following assumptions:

- The land use at this site is designated as industrial use only currently and in the future in the Base Master Plan. However, to assess the need for ICs, contamination present at the site was assessed for unlimited use and unrestricted exposure, in particular, residential use.
- Residual soil contamination exceeds risk-based cleanup levels for recreational and/or residential use. ICs are, therefore, necessary to preclude such uses and to control the disposition and use of any soil excavated from the site.

JOB No. 1009128.04020402 TIME: 01-FEB-2013 11:22 FILE: D:\CAD\Proj\AFCEE\Tatalina\2012 Record of Decision\final\FIG2-8 model SS003.dgn



Notes:

[a] Direct Contact means exposure through both incidental ingestion of sludge, sediment, or surface water and through dermal absorption of the contaminant from sludge, sediment, or surface water.

[b] Ambient Air includes both Indoor Air and Outdoor Air.

[c] This pathway is considered potentially complete but insignificant due to (1) being covered by snow much of the year, and (2) precipitation and cold temperatures minimize volatilization.

[d] This refers to consumable plants or animals. Subsistence plant collection does not currently occur at Lower Camp, and is not anticipated in the future given the restricted access to Areas of Concern at Tatalina LRRS. Consumable animals include moose or caribou that roam through the site.

[e] This pathway is considered to be incomplete because residences or other buildings are not currently located at SS03, nor will they be constructed there in the future.

[f] This pathway is considered to be incomplete because residences or other buildings are not currently located at SS03, nor will they be constructed there in the future.

[g] This pathway is potentially complete, but insignificant because surface water is present intermittently, human contact is minimal, and there are no chemicals of potential concern in surface water.

BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organics
GRO - gasoline range organics
PAHs - polynuclear aromatic hydrocarbons
VOCs - volatile organic compounds

FIGURE 2-8

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

HUMAN HEALTH CONCEPTUAL EXPOSURE MODEL FOR LOWER CAMP SITE SS003

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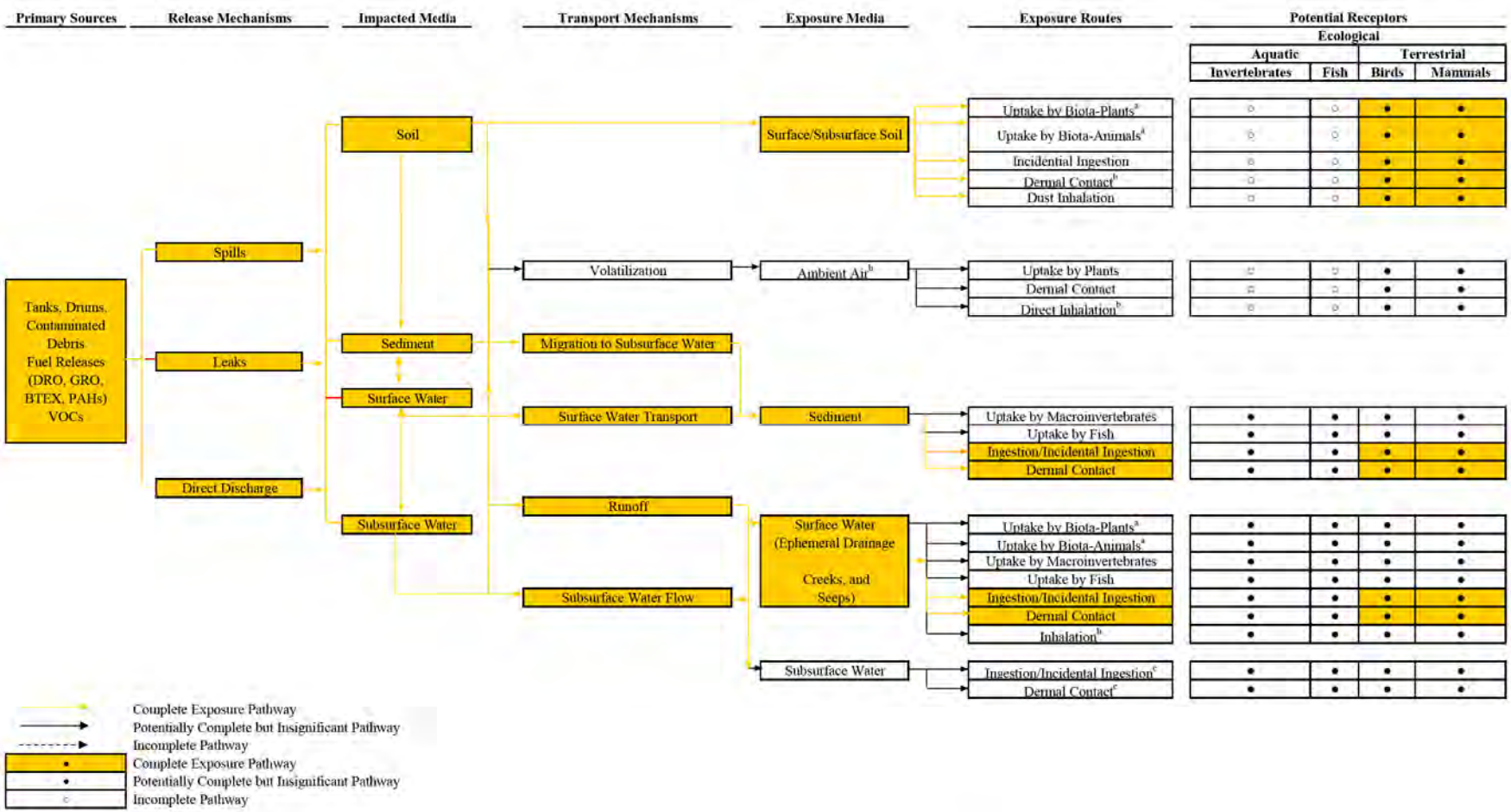

Notes:

[a] This refers to forage or prey items for the indicated receptor.

[b] This pathway is considered potentially complete but insignificant due to (1) being covered by snow much of the year, and (2) precipitation and cold temperatures minimize volatilization.

[c] Ecological receptors are not likely to come into contact with subsurface soil or water and, therefore, these pathways are considered potentially complete but insignificant.

BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organics
GRO - gasoline range organics
PAHs - polynuclear aromatic hydrocarbons
VOCs - volatile organic compounds

FIGURE 2-9

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ECOLOGICAL CONCEPTUAL EXPOSURE MODEL FOR LOWER CAMP SITE SS003

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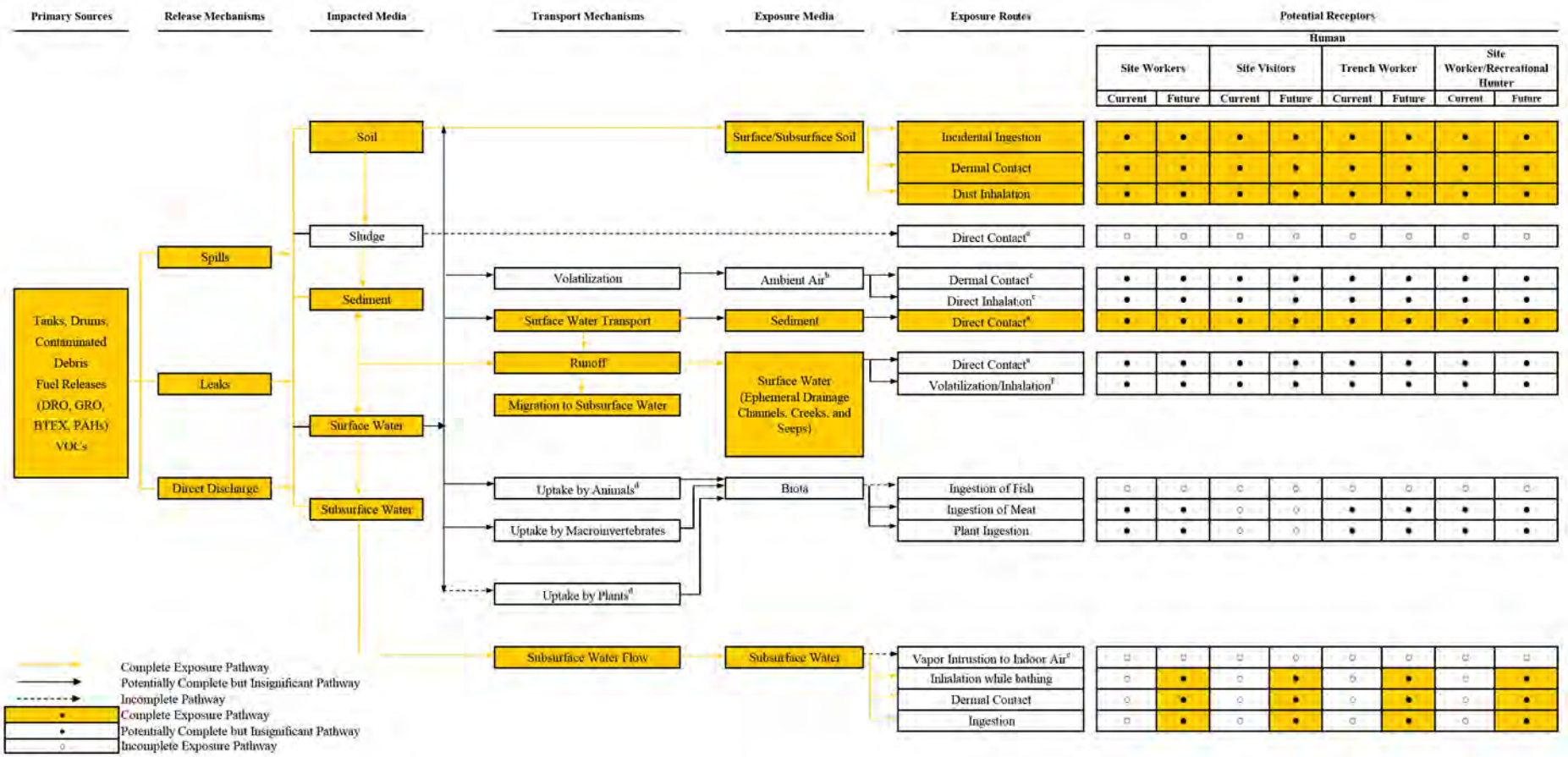

Notes:

[a] Direct Contact means exposure through both incidental ingestion of sludge, sediment, or surface water and through dermal absorption of the contaminant from sludge, sediment, or surface water.

[b] Ambient Air includes both Indoor Air and Outdoor Air.

[c] This pathway is considered potentially complete but insignificant due to (1) being covered by snow much of the year, and (2) precipitation and cold temperatures minimize volatilization.

[d] This refers to consumable plants or animals. Subsistence plant collection does not currently occur at Lower Camp, and is not anticipated in the future given the restricted access to Areas of Concern at Tatalina LRRS. Consumable animals include moose or caribou that roam through the site.

[e] This pathway is considered to be incomplete because residences or other buildings are not currently located at SS08 nor will they be constructed there in the future.

[e] This pathway is considered to be incomplete because residences or other buildings are not currently located at SS08, nor will they be constructed there in the future.

[f] This pathway is potentially complete, but insignificant because surface water is present intermittently, human contact is minimal, and the chemicals of potential concern in surface water, 1-chlorohexane, 2-chloroethyl vinyl ether, and vinyl chloride, were detected at low concentrations.

BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organics
GRO - gasoline range organics
PAHs - polynuclear aromatic hydrocarbons
VOCs - volatile organic compounds

FIGURE 2-10

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

HUMAN HEALTH CONCEPTUAL EXPOSURE MODEL FOR LOWER CAMP SITE SS008

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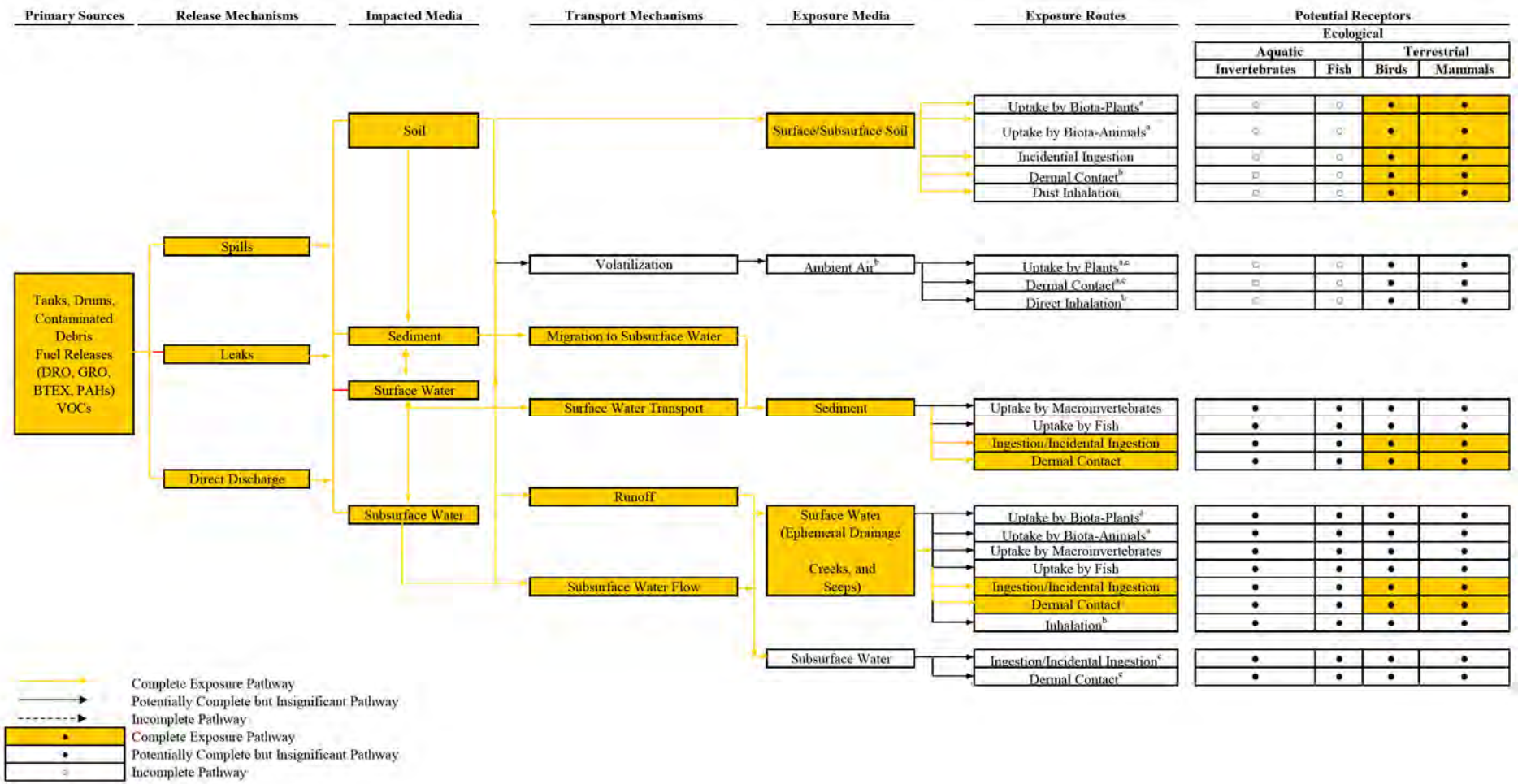

Notes:

[a] This refers to forage or prey items for the indicated receptor.

[b] This pathway is considered potentially complete but insignificant due to (1) being covered by snow much of the year, and (2) precipitation and cold temperatures minimize volatilization.

[c] Ecological receptors are not likely to come into contact with subsurface soil or water and, therefore, these pathways are considered potentially complete but insignificant.

BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organics
GRO - gasoline range organics
PAHs - polynuclear aromatic hydrocarbons
VOCs - volatile organic compounds

FIGURE 2-11

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ECOLOGICAL CONCEPTUAL EXPOSURE MODEL FOR LOWER CAMP SITE SS008

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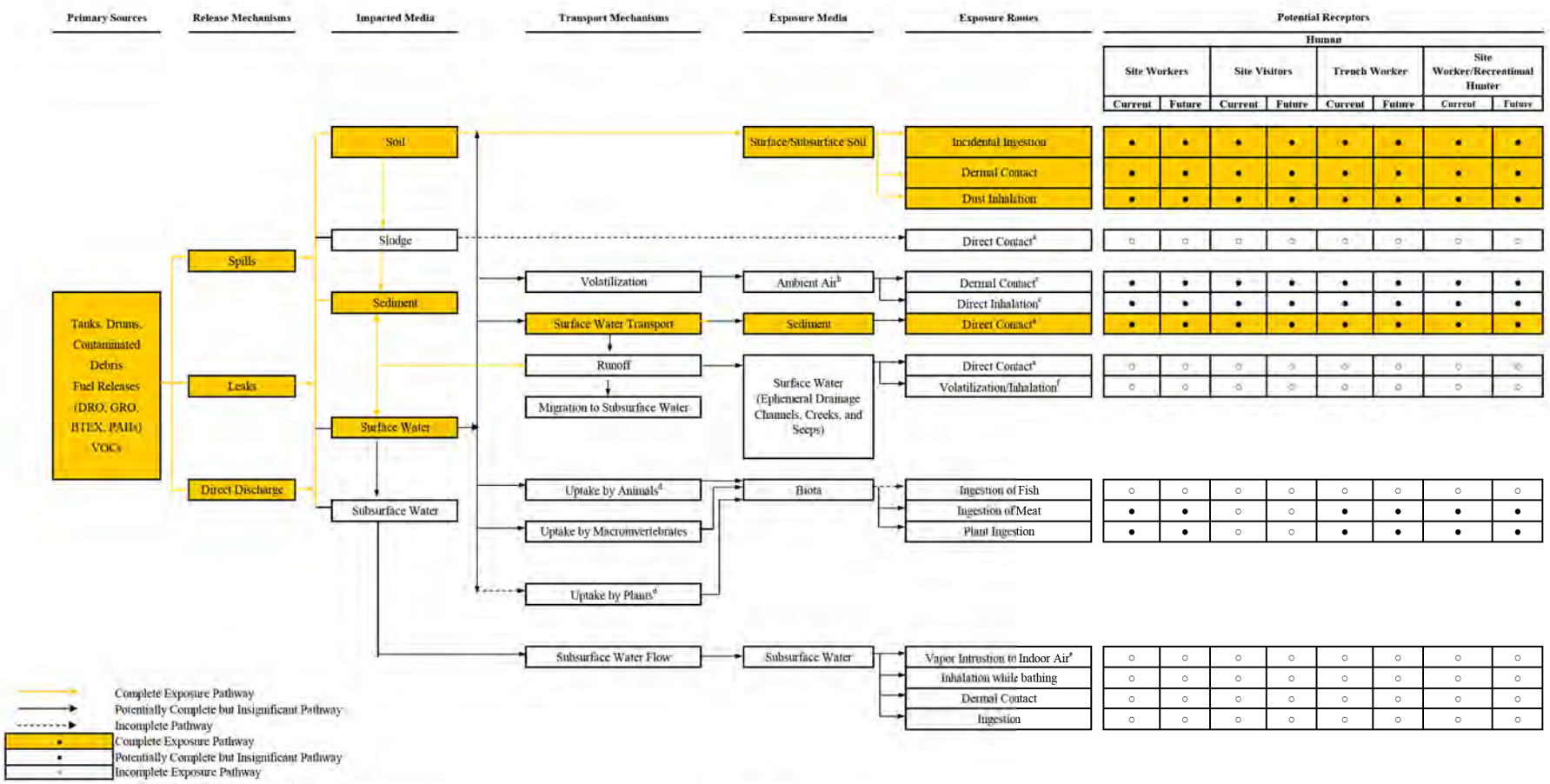
JOB No. 1009128.04020402 TIME: 01-FEB-2013 11:37 FILE: D:\CAD\Proj\AFCEE\Tatalina\2012 Record of Decision\final\FIG2-12 model SS011.dgn



Notes:

[a] Direct Contact means exposure through both incidental ingestion of sediment, or surface water and through dermal absorption of the contaminant from sediment, or surface water.

[b] Ambient Air includes both Indoor Air and Outdoor Air.

[c] This pathway is considered potentially complete but insignificant due to (1) being covered by snow much of the year, and (2) precipitation and cold temperatures minimize volatilization.

[d] This refers to consumable plants or animals. Subsistence plant collection does not currently occur at Lower Camp, and is not anticipated in the future given the restricted access to Areas of Concern at Tatalina LRRS. Consumable animals include moose or caribou that roam through the site.

[e] This pathway is considered to be incomplete because residences or other buildings are not currently located at SS11, nor will they be constructed there in the future.

[f] This pathway is considered to be incomplete because residences or other buildings are not currently located at SS11, nor will they be constructed there in the future.

[g] This pathway is potentially complete, but insignificant because surface water is present intermittently, human contact is minimal, and there are no chemicals of potential concern in surface water at SS11.

BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organics
GRO - gasoline range organics
PAHs - polynuclear aromatic hydrocarbons
VOCs - volatile organic compounds

FIGURE 2-12

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

HUMAN HEALTH CONCEPTUAL EXPOSURE MODEL FOR LOWER CAMP SITE SS011

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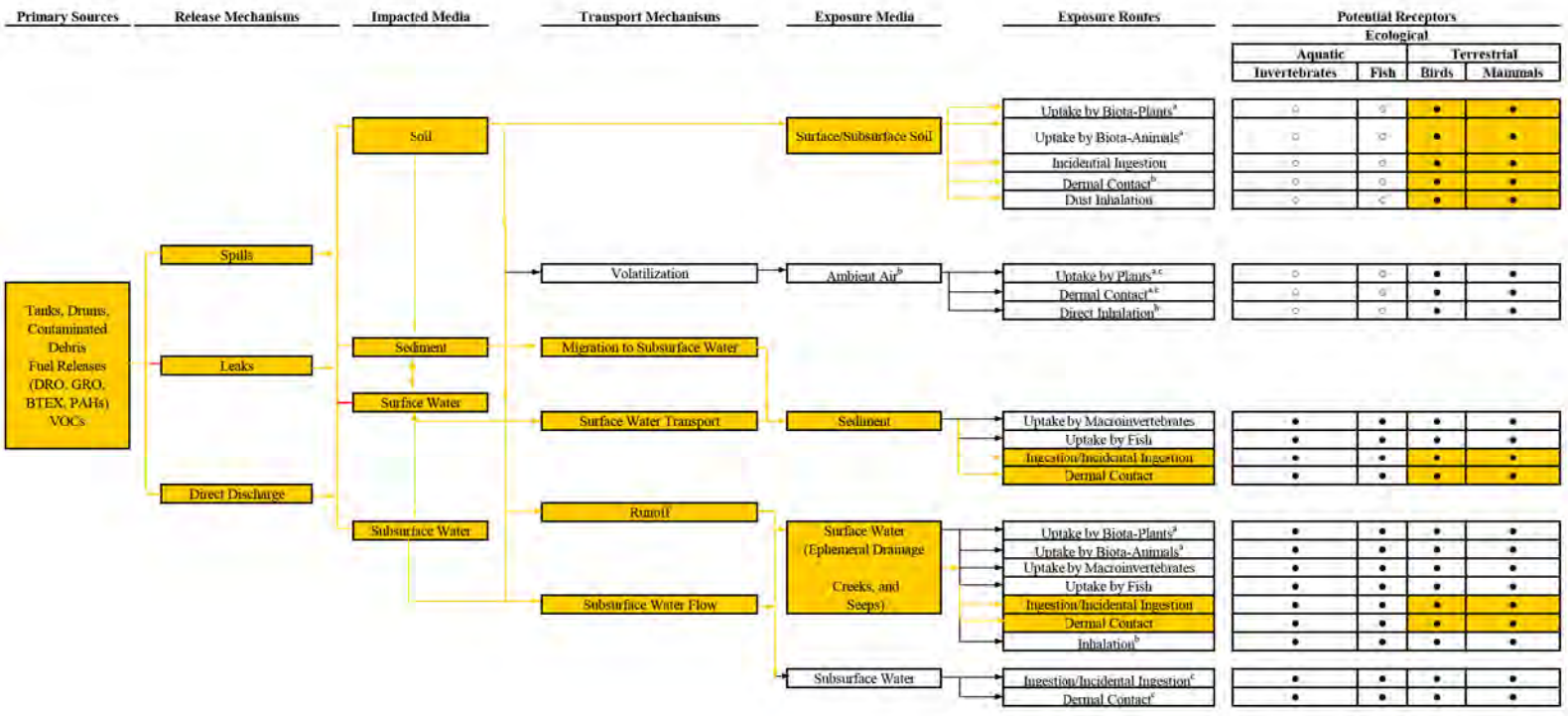

Notes:

[a] This refers to forage or prey items for the indicated receptor.

[b] This pathway is considered potentially complete but insignificant due to (1) being covered by snow much of the year, and (2) precipitation and cold temperatures minimize volatilization.

[c] Ecological receptors are not likely to come into contact with subsurface soil or water and, therefore, these pathways are considered potentially complete but insignificant.

BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organics
GRO - gasoline range organics
PAHs - polynuclear aromatic hydrocarbons
VOCs - volatile organic compounds

FIGURE 2-13

U. S. AIR FORCE - TATALINA LRRS, ALASKA
RECORD OF DECISION FOR SS003, SS008, SS011, AND LF004

ECOLOGICAL CONCEPTUAL EXPOSURE MODEL FOR LOWER CAMP SITE SS011

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- The state has designated all groundwater of the state as potential drinking water. Tatalina LRRS currently does not use this aquifer as a potable drinking water source and does not plan on doing so in the future. Groundwater at SS003 and SS008 does not meet cleanup levels protective of drinking water use. Accordingly, the site must impose ICs to ensure the groundwater is not used for potable purposes until it is remediated to applicable cleanup levels.

2.6.2 Property Transfer

The Air Force will provide notice to the EPA and ADEC, consistent with CERCLA Section 120(h), at least six (6) months prior to any transfer or sale of Air Force property associated with Tatalina LRRS, including transfers to private, state, or local entities, so that the EPA and ADEC can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective land use controls. If it is not possible for the Air Force to notify the EPA and ADEC at least six (6) months prior to any transfer or sale, then the Air Force will notify the EPA and ADEC as soon as possible, but no later than sixty (60) days prior to the transfer or sale of any property subject to land use controls.

In addition to the land transfer notice and discussion provisions above, the Air Force further agrees to provide the EPA and ADEC with similar notice, within the same time frame, as for federal-to-federal transfer or property accountability and administrative control to ADEC. Review and comment opportunities afforded to the EPA and ADEC as to federal-to-federal transfers will be in accordance with all applicable federal laws. All notice and comment provisions above will also apply to leases, in addition to land transfers or sales.

2.6.3 Ground and Surface Water Beneficial Uses

The aquifer beneath and in the vicinity of SS003, SS008, SS011, and LF004 is described in Section 2.5.3. The groundwater beneath SS003 and SS008 is affected by site contamination, while the groundwater at LF004 is not likely to be affected by site contamination. There is no aquifer beneath SS011. Currently, groundwater at Tatalina LRRS is not being used as a potable water source.

An infiltration gallery was installed within the drainage along the eastern side of Lower Camp to provide a water source for Lower Camp. Surface water was observed within the drainage channel during the 1997 RI. The drainage eventually becomes a perennial stream downgradient from the infiltration gallery. This drainage can potentially transport contaminants from sites such as WAA No. 4 at SS008, the former truck fill stand, and other sites along the north side of the ridge.

2.7 SUMMARY OF SITE RISKS

This section summarizes the human health and ecological risk assessments (HHERAs) that have been performed at ERP Sites SS003, SS008, and SS011 (USAF, 2009a). The COCs associated with unacceptable site risk are identified, as well as the potentially exposed populations and exposure pathways of primary concern. A summary of the findings of the ecological risk

assessment (ERA) is also presented. Based on the presence of unacceptable risks to future site workers and recreational activities, remedial action is being recommended to reduce the risks. LF004 was evaluated in an HHERA during the 1997 RI (USAF, 1998b).

2.7.1 Summary of Human Health Risk Assessment

The baseline risk assessment estimates the risks that the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the approaches used and the results of the baseline risk assessments for the sites. The human health risk assessment (HHRA) is divided into the following sections: identification of COCs (hazard assessment), exposure assessment, toxicity assessment, and risk characterization. Potential risks for both current and future site occupants are discussed. Key assumptions and uncertainties associated with the HHRA are also identified. The chemicals, exposure pathways, and populations associated with unacceptable risk are highlighted, as they serve as the primary basis for remedial action. LF004 was evaluated in a HHRA during the 1997 RI and no COCs were found (USAF, 1998b).

2.7.1.1 Identification of Chemicals of Concern

This section identifies those chemicals associated with unacceptable risk at the sites and that are the basis for the proposed remedial action. Although other chemicals were detected at the sites, these COCs are the primary risk-driving chemicals. The data used in this risk assessment was deemed to be of sufficient quality and quantity for its intended use. The detection frequency (number of samples in which the chemical was detected divided by the total number of samples analyzed), range of detected concentrations (maximum and minimum concentrations detected), the exposure point concentrations (EPCs – the calculated or assumed concentration of the chemical at the assumed location of exposure), and the screening concentration (concentration above which the chemical is believed to possibly present a risk to human health or the environment and, thus, require further evaluation) for chemicals and media of concern are presented in **Tables 2-3**, **2-4**, and **2-5** for SS003, SS008, and SS011, respectively.

Table 2-3 Summary of Chemicals of Concern and Medium-Specific EPCs at SS003

Media	Chemical of Concern	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Surface Soil[1]	Naphthalene	0.00064	160	72	51
	1,2,4-Trimethylbenzene	0.0014	1,400	50	431
	1,3,5-Trimethylbenzene	0.00078	510	50	81
Groundwater[2]	Benzene	0.0028	0.335	95	0.12
	Ethylbenzene	0.00049	0.405	91	0.14
	3,3'-Dichlorobenzidine	0.005	0.005	33	0.0050
	Bis(2-chloroethyl) Ether	0.0005	0.0005	33	0.00050
	Hexachlorobutadiene	0.003	0.003	4	0.0030

Table 2-3 (Cont.) Summary of Chemicals of Concern and Medium-Specific EPCs at SS003

Media	Chemical of Concern	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Groundwater[2] (Cont.)	DRO	0.19	6.4	95	3.5
	GRO	0.115	7.5	95	3.4
	RRO	0.085	6.9	33	3.4

Key:
1 – Concentrations reported in milligrams per kilogram (mg/Kg).
2 – Concentrations reported in milligrams per liter (mg/L).
DRO – diesel range organics
EPC – exposure point concentration
GRO – gasoline range organics
RRO – residual range organics

Table 2-4 Summary of Chemicals of Concern and Medium-Specific EPCs at SS008

Media	Chemical of Concern	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Surface Soil[1]	Arochlor 1260	0.02	17	88	11.50
Groundwater[2]	1,2-Dibromomethane	0.001	0.001[3]	5	0.0010
	2-Methylnaphthalene	0.464	0.464	33	0.46
	DRO	0.036	190	52	36
	Lead	0.001	0.331	84	0.087

Key:
1 – Concentrations reported in milligrams per kilogram (mg/Kg).
2 – Concentrations reported in milligrams per liter (mg/L).
3 – With the exception of two samples from 1997 with reported concentrations, the analyte was not detected in all samples. However, the Method Reporting Limit (MRL) is greater than the cleanup level for all nine samples indicated to have concentrations above the cleanup level.
EPC – exposure point concentration
DRO –diesel range organics

Table 2-5 Summary of Chemicals of Concern and Medium-Specific EPCs at SS011

Media	Parameter	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Surface Soil[1]	Benzo(a)anthracene	0.0068	3,100	50	950
	Benzo(a)pyrene	0.0068	1,800	39	286
	Benzo(b)fluoranthene	0.019	2,300	50	705
	Benzo(k)fluoranthene	0.0085	790	36	166
	Chrysene	0.049	3,500	56	1,066
	Dibenz(a,h)anthracene	0.0025	210	33	34

Table 2-5 (Cont.) Summary of Chemicals of Concern and Medium-Specific EPCs at SS011

Media	Parameter	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Surface Soil[1] (Cont.)	Indeno(1,2,3-cd)pyrene	0.0070	640	33	103
	Alpha-BHC	0.0003	2	44	0.70
	2-Methylnaphthalene	0.037	8,600	46	3,697
	Naphthalene[2]	0.0016	13,000	55	3,555
	DRO	19	200,000	100	79,575
	RRO	104	160,000	100	60,057

Key:
1 – Concentrations reported in milligrams per kilogram (mg/Kg).
2 – Non-cancer Hazard Index
BHC – benzene hexachloride
EPC – exposure point concentration
DRO – diesel range organics
RRO – residual range organics

The HHRA for SS003, SS008, and SS011 was performed in accordance with, or in consideration of, the most recent ADEC, EPA, and Air Force guidance documents or reference materials (USAF, 2009a).

2.7.1.2 Exposure Assessment

This section documents the populations and exposure pathways that were quantitatively evaluated in the risk assessment. A CEM was developed to aid in determining reasonable exposure scenarios and pathways of concern. As described in this section, both current and future populations have been evaluated based on current and reasonably anticipated future land use. The contaminated media to which people may be exposed is also discussed. Resources other than land may be involved.

CEMs for human health and ecological receptors are described in the following sections, based upon the chemicals of potential concern (COPCs) and chemicals of potential ecological concern (COPECs) identified for SS003, SS008, and SS011 and are presented in Figures 2-8 through 2-13.

2.7.2 Human Health CEM

The human health CEMs for Lower Camp ERP Sites SS003, SS008, and SS011 are graphically presented on Figures 2-8, 2-10 and 2-12, respectively, and are discussed below for surface and subsurface soil, surface water and sediment, sludge, and subsurface water. CEMs were not provided in the risk assessment for LF004.

2.7.2.1 Surface and Subsurface Soils

Human receptors with a potential for exposure to Lower Camp soils include Tatalina LRRS contract personnel (site workers), recreational hunter/fisher/gatherers who are contract personnel, trench workers, and site visitors. Areas of concern at the Lower Camp have posted restricted access and subsistence hunter/fisher/gatherers, including members of the Takotna community, located approximately 10 miles northwest of Tatalina, are not permitted access to these areas. Signs are posted that indicate entrance to the installation and areas off the road are off-limits. There are also no trespassing signs periodically posted along the road. However, the Sterling Landing/Takotna/Ophir Road, a State of Alaska Department of Transportation and Public Facilities Road, bisects the Air Force property and Lower Camp. The Industrial Dome and Residential Dome, as well as SS008, are on the upslope side of the road, while SS003 and SS011 are on the downslope side.

Site workers work primarily indoors at Lower Camp, performing routine maintenance activities. In addition, site workers who maintain the MAR facility at Upper Camp are based out of Lower Camp. Although exposures between site workers and Lower Camp soils are not anticipated on a routine basis, there is a potential for soil exposures, particularly during recreational activities such as hunting. Potentially complete exposure pathways between site workers and soil COPCs include incidental oral, dermal, and inhalation contact with soil or soil particulates. Trench workers and site visitors to the Lower Camp, such as contractors performing environmental monitoring or cleanup activities, may be exposed to COPCs in soil through similar pathways.

As stated above, the Areas of Concern at Lower Camp have restricted access and subsistence fishing/hunting/gathering does not occur in these areas. However, site workers may engage in hunting or gathering in the area, or fishing in the rivers surrounding the LRRS (i.e., the Kuskokwim, Takotna, and Tatalina rivers) during non-work hours. Fishing does not occur at SS003, SS008, or SS011 because on-site surface water drainage channels, creeks, and seeps are ephemeral and do not contain fish.

Caribou, moose, bears, and other animals forage within Tatalina LRRS and may briefly come into contact with contaminated soils at SS003, SS008, or SS011. However, the primary COPCs present at SS003, SS008, and SS011 (i.e., PHCs including DRO, GRO, RRO, VOCs, and PAHs) do not tend to biomagnify in terrestrial organisms (ATSDR, 1989; Eisler, 1987). Furthermore, although some compounds that may biomagnify were also identified as COPCs, including DDT and Arochlor 1260 at SS008, the foraging range of game animals is considerably larger than the areas potentially affected by site-related contaminants and contact with site contaminants would be expected to be minimal. In addition, the presence of DDT is likely the result of historic application of DDT-related compounds at Tatalina LRRS for insect and vegetation control (USAF, 1998b). However, PCBs and DDTs were included in the HHRA and considered for cumulative risk purposes as appropriate.

Although site workers may gather herbs or berries in the area, berry bushes and other food plants generally do not grow in the cleared and disturbed areas of Lower Camp where SS003, SS008, and SS011 are located, and the potential for contamination to migrate to areas where the plants do grow is low (USAF, 1998b). In addition, the primary contaminants associated with surface

soils at SS003, SS008, and SS011 (i.e., weathered GRO and DRO constituents) have a tendency to be sequestered in soil (Manilal and Alexander, 1991) and are only poorly taken up by plants and animals (Kaplan et al., 1996). Therefore, the potential for exposure of site workers who are recreational hunters to soil COPCs through harvesting wild game or gathering wild plants is deemed to be potentially complete, but insignificant.

2.7.2.2 Surface Water and Sediment

No COPCs were identified for surface water at SS011. Titanium was identified as the only COPC for surface water at SS003. Titanium was selected as a COPC because screening criteria were not available. VOCs (1-chlorohexane, 2-chloroethyl vinyl ether, and vinyl chloride) were identified as COPCs for a seep at SS008. In the baseline risk assessment conducted as part of the 1997 RI, these constituents were not selected as COPCs because they were not considered to be site-related. Vinyl chloride was detected in one surface water sample at only slightly greater than one-tenth the ADEC Table C Groundwater Cleanup Level.

The ADEC Table C Groundwater Cleanup Levels are based on the assumption that the water is used as a drinking water source, which is not the case for the seep at SS008. Potable water for drinking and bathing is obtained from wells located at the infiltration gallery. Because potable water is obtained from another source, potential direct exposure pathways (i.e., oral, dermal, or inhalation routes of exposure) between surface water COPCs and site workers or visitors are incomplete. Furthermore, surface water at SS003, SS008, and SS011 is present only intermittently, so any potential incidental contact with this water would be minimal. Therefore, potential exposure to surface water at SS003, SS008, and SS011 is deemed potentially complete, but insignificant.

Caribou, moose, bears, and other animals may consume surface water from the ephemeral drainage channels, creeks, and seeps at SS003, SS008, or SS011. However, no COPCs were identified for surface water at SS011, the COPC for surface water at SS003 (titanium), and the COPCs for surface water at SS008 (1-chlorohexane, 2-chloroethyl vinyl ether, and vinyl chloride) are VOCs and would not be expected to biomagnify in terrestrial organisms. Furthermore, there are many sources of water in the area for game animals, such that animals would not be expected to obtain a significant amount of water from the seep at SS008. Therefore, this exposure pathway was deemed to be potentially complete, but insignificant, because uptake by game animals is not expected to be significant.

Contract personnel may engage in recreational fishing in the rivers surrounding Tatalina LRRS during leisure time. However, since no COPCs were identified for surface water at SS011, the site-related contaminants that may reach the rivers are not expected to be present at concentrations that would be of concern. Therefore, potential exposure of contract personnel to surface water COPCs through incidental ingestion or dermal contact with surface water in the rivers surrounding Tatalina LRRS while fishing is deemed potentially complete, but insignificant. Recreational fishermen may also potentially consume fish harvested from the rivers surrounding Tatalina LRRS. This exposure pathway is also deemed potentially complete, but insignificant, because uptake by fish is not expected to be significant, given the low potential for

contaminants at concentrations of concern in the rivers and because VOCs are not expected to biomagnify in aquatic organisms.

Arsenic and chromium were identified as COPCs for sediment at SS011. Aluminum, arsenic, chromium, cobalt, manganese, titanium, and vanadium were identified as COPCs for sediment at SS003. Aluminum, arsenic, chromium, cobalt, lead, manganese, titanium, vanadium, benzo(a)pyrene, DDT, and Arochlor 1260 were identified as COPCs for sediment at SS008. Both DDT and Arochlor 1260 were detected in SS008 sediment samples at maximum concentrations (2.5 mg/Kg for DDT and 0.19 mg/Kg for Arochlor 1260) only slightly greater than one-tenth the ADEC Table B Soil Cleanup Levels (2.1 mg/Kg for DDT and 0.1 mg/Kg for Arochlor 1260). However, Arochlor 1260 and DDT are carried through the HHRA and considered for cumulative risk purposes, as appropriate. Human contact with sediment within these areas is anticipated to be minimal. However, there is a potential (albeit low) for contract personnel or site visitors to be exposed to these areas during recreational hunting activities. Potential exposures between recreational hunters and COPCs to on-site sediment include direct exposure pathways (i.e., incidental ingestion and dermal contact).

As described above for soil, the potential for exposure of recreational hunters to on-site sediment COPCs through harvesting of wild game is deemed to be potentially complete, but insignificant. This is because wild game such as caribou, moose, and bears have minimal contact with Lower Camp ERP Sites SS003, SS008, and SS011.

2.7.2.3 Sludge

Upon comparison of maximum detected analyte concentrations in sludge to the soil screening criteria, aluminum, arsenic, chromium, cobalt, copper, manganese, titanium, and vanadium were identified as COPCs for sludge samples collected from the septic tank at SS008. No information could be found regarding the current status of the septic tank. The 1997 Final RI Report (USAF, 1998b) states that the septic tank was partially backfilled in the mid-1990s, but it is not known whether or not any additional actions were taken. According to the 1997 RI Report (USAF, 1998b), analytical results from sludge samples collected from the abandoned septic tank indicate the contents are not Resource Conservation and Recovery Act (RCRA) hazardous wastes and do not require special handling or disposal. The two sludge samples were analyzed by EPA Solid Waste Methods (SW)6010, SW7470, SW8260, and SW8880 during the Toxicity Characteristic Leaching Procedure (TCLP); results were well below RCRA regulatory limits established in 40 CFR 261.

In addition to the TCLP analyses described above, the two sludge samples were also analyzed by Alaska Test Methods (AK)101, AK102, AK103, SW8260, SW8270, SW8081, SW9010, SW9030, SW9045, SW1020, SW6010, SW7041, SW7060, SW7470, SW7471, SW7740, and SW7841. Applicable soil screening criteria were only exceeded by the metals listed above. Concentrations of VOCs, SVOCs, PAHs, chlorinated pesticides, and PHCs were all below applicable soil screening criteria. The septic tank at SS008 is buried and, as a result, direct contact with sludge in the septic tank is an incomplete exposure pathway. Furthermore, none of the COPCs for sludge are volatile so inhalation of constituents volatilizing from sludge into ambient air is also an incomplete exposure pathway. Therefore, sludge was not evaluated further.

2.7.2.4 Subsurface Water

COPCs identified for subsurface water beneath SS003 and SS008 include various inorganics, VOCs, SVOCs (including PAHs), DRO, GRO, and RRO. Groundwater was not observed beneath SS011 during site investigations.

Subsurface water beneath SS003 or SS008 is not currently used as a potable water supply, and it is unlikely that it will be used for such purposes in the future. Potable water for Tatalina LRRS is supplied through an infiltration gallery collection system located at Lower Camp. It is highly unlikely that contamination in subsurface water at SS003 or SS008 has impacted the infiltration gallery, because a water sample collected from the infiltration gallery in 1997 did not contain any VOCs, SVOCs, or pesticides. Low levels of metals and DRO were detected in that sample.

Consistent with State of Alaska regulations (18 AAC 75.345), however, all subsurface water within the State should be evaluated as a potential drinking water supply unless a 350 Determination precludes potable uses. Therefore, subsurface water beneath SS003 and SS008 will be evaluated as a potential potable supply for future human receptors.

2.7.2.5 Toxicity Assessment

This section describes the carcinogenic and non-carcinogenic toxicity criteria used to calculate the potential risk for each COC. Carcinogenic toxicity is the tendency of a chemical to cause cancer. Non-carcinogenic toxicity includes all other adverse health effects of a chemical. Toxicity data for carcinogens is presented in **Table 2-6**. When available, separate toxicity criteria are listed for ingestion (oral intake, swallowing), inhalation (breathing into the lungs), and dermal (absorption through the skin) routes of exposure. For carcinogenic COCs, the toxicity criteria is the slope factor – a number that, when multiplied by the daily dose of the chemical, yields the expected incidence of cancer in a population. For example, a slope factor of 2 milligrams per kilogram per day $(mg/Kg\text{-}day)^{-1}$ multiplied by a daily dose of 0.001 mg/Kg-day would yield a cancer incidence of 0.002, which would be 2,000 cancers in a population of 1 million. The weight of evidence/cancer guideline description is a descriptor, usually provided by the EPA, classifying the degree of confidence that the chemical is a human carcinogen. Slope factors and weight of evidence/cancer guideline descriptions are listed in Table 2-6, along with the source of each slope factor and date of its publication.

For non-carcinogenic chemicals, the toxicity criteria is the reference dose (RfD). The RfD is the maximum daily dose of the chemical that is not expected to cause any adverse effect on human health. The RfD is calculated from actual dosing data (experimental animals or humans) by dividing the observed dose that produces no effects by "uncertainty" or "safety" factors that range from 3 to 3,000, depending on the relevance and quality of the study used, to yield a daily dose that has a high certainty of being safe for humans because it is lower than the observed "safe" dose by a factor of 3 to 3,000.

Table 2-6 Toxicity Values used in the Human Health Risk Assessment at ERP Sites SS003, SS008, and SS011

Chemical of Potential Concern	CAS Number	Cancer Slope Factor (mg/kg-d)$^{-1}$		URF (ug/m^3)	Chronic RfD (mg/kg-d)		RfC (mg/m3)	ABS_{GI} [a]	Critical Effect
		Oral	Dermal[b]	Inhalation	Oral	Dermal[b]	Inhalation		
Inorganics									
Aluminum	7429-90-5	na	na	na	1.0E+00 P	1.0E+00 R	4.9E-03 P	100%	Neurological effects
Antimony	7440-36-0	na	na	na	4.0E-04 I	6.0E-05 R	na	15%	Longevity, blood glucose, and cholesterol
Arsenic	7440-38-2	1.5E+00 I	1.5E+00 R	4.3E-03 I	3.0E-04 I	3.0E-04 R	3.0E-05 C	95%	Dermal effects: Hyperpigmentation and keratosis
Barium	7440-39-3	na	na	na	2.0E-01 I	1.4E-02 R	4.9E-04 H	7%	Nephropathy
Beryllium		na	na	2.4E-03 I	2.0E-03 I	1.4E-05 R	2.0E-05 I	0.7%	Lesions
Cadmium, soil	7440-43-9	na	na	1.8E-03 I	1.0E-03 I	2.5E-05 R	na	2.5%	Hematologic: proteinuria
Cadmium, water	7440-43-9	na	na	1.8E-03 I	5.0E-04 I	2.5E-05 R	na	5%	Hematologic: proteinuria
Chromium (III)	16065-83-1	na	na	na	1.5E+00 I	2.0E-02	na	1.3%	na
Cobalt	7440-48-4	na	na	9.0E-03 P	3.0E-04 P	3.0E-04 R	6.0E-06 P	100%	na
Copper	7440-50-8	na	na	na	4.0E-02 H	4.0E-02 R	na	100%	na
Lead	7439-92-1	na [c]	na [c]	na [c]	na [c]	na [c]	na [c]	na	na
Manganese	7439-96-5	na	na	na	2.4E-02 I	9.6E-04 R	5.0E-05 I	4%	Neurological and neuro-behavioral effects
Mercury	7439-97-6	na	na	na	3.0E-04 I	2.1E-05 R	3.0E-04 I	7%	Neurological and neuro-behavioral effects
Nickel	7440-02-0	na	na	na	2.0E-02 I	8.0E-04	na	4%	Decreased body and organ weights
Selenium	7782-49-2	na	na	na	5.0E-03 I	1.5E-03 R	na	30%	Clinical selenosis
Thallium	7440-28-0	na	na	na	8.0E-05 I	8.0E-05 R	na	100%	Increased levels of SGOT and LDH
Titanium	7440-32-6	na	na	na	na	na	na	na	na
Vanadium	7440-62-2	na	na	na	5.0E-03 I	1.3E-04 R	na	2.6%	Decreased hair cystine
Zinc	7440-66-6	na	na	na	3.0E-01 I	3.0E-01 R	na	na	Decrease in ESOD activity
Volatile Organic Compounds									
1,2,4-Trimethylbenzene	95-63-6	na	na	na	na	na	7.0E-03 P	100%	na
1,3,5-Trimethylbenzene	108-67-8	na	na	na	5.0E-02 P	5.0E-02 R	6.0E-03 P	100%	na
1,2-Dibromoethane	106-93-4	2.0E+00 I	2.0E+00 R	6.0E-04 I	9.0E-03 I	9.0E-03 R	9.0E-03 I	100%	Testicular atrophy, liver peliosis, and adrenal cortical degeneration
1,2-Dichloroethane	107-06-2	9.1E-02 I	9.1E-02 R	2.6E-05 I	2.0E-02 P	2.0E-02 R	2.4E+00 A	100%	Hemangiosarcomas
1-Chlorohexane	544-10-5	na	na	na	na	na	na	na	na
2-Chloroethyl Vinyl Ether	10-75-8	na	na	na	na	na	na	na	na
Benzene	71-43-2	5.5E-02 I [d]	5.5E-02 R [d]	7.8E-06 I	4.0E-03 I	4.0E-03 R	3.0E-02 I	100%	Decreased lymphocyte count
Ethylbenzene	100-41-4	1.1E-02 C	1.1E-02 R	2.5E-06 C	1.0E-01 I	1.0E-01 R	1.0E+00 I	100%	Liver and kidney toxicity, and developmental effects
m,p-Xylenes	108-38-3/106-42-3	na	na	na	2.0E-01 I [e]	2.0E-01 R [e]	1.0E-01 I [e]	100%	Decreased body weight, increased mortality
n-Butylbenzene	104-51-8	na	na	na	1.0E-01 I [f]	1.0E-01 R [f]	4.0E-01 I [f]	100%	Kidney Effects
n-Propylbenzene	103-65-1	na	na	na	4.0E-02 I	4.0E-02 R	1.4E-01 I	100%	Hepatic and Renal Toxicity
o-Xylene	95-47-6	na	na	na	2.0E+00 H	2.0E+00 R	1.0E-01 I [e]	100%	Decreased body weight, increased mortality
p-Isopropyltoluene	99-87-6	na	na	na	1.0E-01 I [g]	1.0E-01 R [g]	4.0E-01 I [g]	100%	na
sec-Butylbenzene	135-98-8	na	na	na	1.0E-01 I [f]	1.0E-01 R [f]	4.0E-01 I [f]	100%	Kidney Effects
Tert-Butylbenzene	98-06-6	na	na	na	1.0E-01 I [f]	1.0E-01 R [f]	4.0E-01 I [f]	100%	Kidney Effects
Toluene	108-88-3	na	na	na	8.0E-02 I	8.0E-02 R	5.0E+00 I	100%	Neurological effects
Total xylenes	NA	na	na	na	2.0E-01 I	2.0E-01 R	1.0E-01 I	100%	Decreased body weight, increased mortality
Trichloroethene	79-01-6	1.3E-02 C	1.3E-02 R	2.0E-06 C	na	na	na	100%	Hepatic, Renal and Neurotoxicity
Vinyl Chloride	75-01-4	7.2E-01 I	7.2E-01 R	4.4E-06 I	3.0E-03 I	3.0E-03 R	1.0E-01 I	100%	Hepatic Toxicity

Table 2-6 Toxicity Values used in the Human Health Risk Assessment at ERP Sites SS003, SS008, and SS011

Chemical of Potential Concern	CAS Number	Cancer Slope Factor (mg/kg-d)$^{-1}$		URF (ug/m^3)	Chronic RfD (mg/kg-d)		RfC (mg/m3)	ABS_{GI} [a]	Critical Effect
		Oral	Dermal[b]	Inhalation	Oral	Dermal[b]	Inhalation		
Semi-volatile Organic Compounds									
2-Nitroaniline	88-74-4	na	na	na	3.00E-03 P	3.0E-03 R	3.0E-05 P	100%	na
2-Nitrophenol	88-75-5	na	na	na	5.0E-04 I [h]	5.0E-04 R [h]	2.0E-03 H [h]	100%	na
3,3'-Dichlorobenzidine	91-94-1	4.5E-01 I	4.5E-01 R	na	na	na	na	100%	na
3-Nitroaniline	99-09-2	2.1E-02 P	2.1E-02 R	na	3.00E-04 P	3.0E-04 R	1.0E-03 P	100%	na
4-Chloro-3-methylphenol	59-50-7	na	na	na	na	na	na	na	na
4-Chloroaniline	106-47-8	2.1E-02 P	na	na	4.0E-03 I	4.0E-03 R	na	100%	na
4-Methylphenol	106-44-5	na	na	na	5.0E-03 H [i]	5.0E-03 R [i]	na	100%	na
Bis(2-chloroethyl) Ether	111-44-4	1.1E+00 I	1.1E+00 R	3.3E-04 I	na	na	na	100%	na
Dibenzofuran	132-64-9	na	na	na	2.0E-03 P	2.0E-03 R	na	100%	na
Hexachlorobutadiene	87-68-3	7.8E-02 I	7.8E-02 R	2.20E-05 I	1.0E-03 P	1.0E-03 R	na	100	na
Polynuclear Aromatic Hydrocarbons									
2-Methylnaphthalene	91-57-6	na	na	na	4.0E-03 I	4.0E-03 R	na	89%	Pulmonary changes
Acenaphthene	83-32-9	na	na	na	6.0E-02 I	6.0E-02 R	na	89%	Hepatotoxicity
Anthracene	120-12-7	na	na	na	3.0E-01 I	3.0E-01 R	na	89%	No effects observed
Benzo(a)anthracene	56-55-3	7.3E-01 I	7.3E-01 R	1.1E-04 C	na	na	na	89%	na
Benzo(a)pyrene	50-32-8	7.3E+00 I	7.3E+00 R	1.1E-03 C	na	na	na	89%	na
Benzo(b)fluoranthene	205-99-2	7.3E-01 I	7.3E-01 R	1.1E-04 C	na	na	na	89%	na
Benzo(g,h,i)perylene	191-24-2	na	na	na	3.0E-02 I [j]	3.0E-02 R [j]	na	89%	Kidney effects
Benzo(k)fluoranthene	207-08-9	7.3E-02 I	7.3E-02 R	1.1E-04 C	na	na	na	89%	na
Chrysene	218-01-9	7.3E-03 I	7.3E-03 R	1.1E-05 C	na	na	na	89%	na
Dibenz(a,h)anthracene	53-70-3	7.3E+00 I	7.3E+00 R	1.2E-03 C	na	na	na	89%	na
Fluoranthene	206-44-0	na	na	na	4.0E-02 I	4.0E-02 R	na	89%	Nephropathy, increased liver weights, blood changes, and clinical effects
Fluorene	86-73-7	na	na	na	4.0E-02 I	4.0E-02 R	na	89%	Blood changes
Indeno(1,2,3-cd)pyrene	193-39-5	7.3E-01	7.3E-01 R	1.1E-04 C	na	na	na	89%	na
Naphthalene	91-20-3	na	na	3.4E-05 C	2.0E-02 I	2.0E-02 R	3.0E-03 I	89%	Decreased body weight; Nasal, olfactory and respiratory effects
Phenanthrene	85-01-8	na	na	na	3.0E-01 I [k]	3.0E-01 R [k]	na	89%	Kidney effects
Pyrene	129-00-0	na	na	na	3.0E-02 I	3.0E-02 R	na	89%	Kidney effects
Pesticides									
4,4'-DDT	50-29-3	3.4E-01 I	3.4E-01 I	9.7E-05 I	5.0E-04 I	5.0E-04 R	na	70%	Liver lesions
Aldrin	309-00-2	1.7E+01 I	1.7E+01 R	4.9E-03 I	3.0E-05 I	3.0E-05 R	na	100%	Liver toxicity
Alpha-BHC	319-84-6	6.3E+00 I	6.3E+00 R	1.8E-03 I	na	na	na	100%	na
Alpha-Chlordane	5103-71-9	3.5E-01 I [l]	3.5E-01 R [l]	1.0E-04 I [l]	5.0E-04 I [l]	5.0E-04 R [l]	7.0E-04 I [l]	80%	Hepatic necrosis
Delta-BHC	319-86-8	1.8E+00 I	1.8E+00 R	5.10E-04 I	na	na	na	100%	Liver nodules and hepatocellular carcinomas
Dieldrin	60-57-1	1.6E-01 I	1.6E-01 R	4.60E-03	5.0E-05 I	5.0E-05 R	na	100%	Hepatic Toxicity
Endrin	72-20-8	na	na	na	3.0E-04 I	3.0E-04 R	na	100%	Mild liver lesions, occasional convulsions
Endrin Aldehyde	7421-93-4	na	na	na	3.0E-04 I [m]	3.0E-04 R [m]	na	100%	na
Endrin ketone	53494-70-5	na	na	na	3.0E-04 I [m]	3.0E-04 R [m]	na	100%	na
Heptachlor	76-44-8	4.5E+00 I	4.5E+00 R	1.3E-03 I	5.0E-04 I	5.0E-04 R	na	100%	Liver weight increases in males
Toxaphene	8001-35-2	1.1E+00 I	1.1E+00 R	3.1E-04 I	na	na	na	100%	na

Table 2-6 Toxicity Values used in the Human Health Risk Assessment at ERP Sites SS003, SS008, and SS011

Chemical of Potential Concern	CAS Number	Cancer Slope Factor (mg/kg-d)$^{-1}$		URF (ug/m^3)	Chronic RfD (mg/kg-d)		RfC (mg/m3)	ABS_{GI} [a]	Critical Effect
		Oral	Dermal[b]	Inhalation	Oral	Dermal[b]	Inhalation		
Polychlorinated Biphenyls									
Arochlor 1260	11096-82-5	2.0E+00 I	2.0E+00 R	1.0E-04 I	na	na	na	81%	na
Petroleum Hydrocarbons									
DRO, Aliphatic	na	na	na	na	1.0E-01 [n]	na	1.0E+00 [n]	na	Hepatotox/Hemtological
DRO, Aromatic	na	na	na	na	4.0E-02 [n]	na	2.0E-01 [n]	na	Decreased body weight
GRO, Aliphatic	na	na	na	na	5.0E+00 [n]	na	1.8E+01 [n]	na	Neurotoxicity
GRO, Aromatic	na	na	na	na	2.0E-01 [n]	na	4.0E-01 [n]	na	Hepatotox/Nephrotox
RRO, Aliphatic	na	na	na	na	2.0E+00 [n]	na	na	na	na
RRO, Aromatic	na	na	na	na	3.0E-02 [n]	na	na	na	na

Sources:

A Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (ATSDR, 2007)

I Integrated Risk Information System (IRIS) Database (USEPA, 2009).

P Provisional Peer Reviewed Toxicity Values (PPRTVs) (USEPA 2008)

C California EPA Toxicity Values (OEHHA, 2008)

H Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997a).

R Route Extrapolation.

Notes:

% - percent

ug/m^3 - micrograms per cubic meter

ABS_{GI} - Oral Absorption Efficiencies

ADEC Alaska Department of Environmental Conservation

CSF - Cancer Slope Factor

DDT - dichlorodiphenyltrichloroethane

DRO - diesel range organics

EPA - U. S. Environmental Protection Agency

ERP - Environmental Restoration Program

ESOD - erythrocyte superoxide dismutase

GRO - gasoline range organics

mg/m^3 - milligrams per cubic meter

na - not available

RAGS - risk assessment guidance for Superfund

RfC - Reference Concentration

RfD - Reference Dose

RRO - residual range organics

SGOT - serum glutaimic oxaloacetic transciminase

URF - Unit Risk Factor

[a] Values are from EPA RAGS Part E. Where no specific ABS_{GI} is available, the ABS_{GI} is assumed to be 100%. (USEPA 2004b)

[b] The following equations are used as recommended by the EPA (2004c) to estimate dermal CSF and RfDs from the ingestion toxicity values when ABS_{GI} is less than 50%: Dermal RfD = Oral RfD x ABS_{GI} and Dermal CSF = Oral SF/ABS_{GI}. When ABS_{GI} is greater than 50%, the dermal CSF and/or RfD is assumed to be equal to the oral CSF and/or RfD (USEPA, 2004c).

[c] Per ADEC (2005a) guidance, lead is evaluated using biokinetic models; refer to Section 5.2.2.3.

[d] Benzene oral slope factor range: 1.5 x 10-2 to 5.5 x 10-2 per (mg/kg)/day. Highest CSF shown for conservatism.

[e] Xylenes used as a surrogate chemical based on similar chemical structure and toxicological properties.

[f] Isopropylbenzene used as a surrogate chemical based on similar chemical structure and toxicological properties.

[g] Cumene used as a surrogate chemical based on similar chemical structure and toxicological properties.

[h] Nitrobenzene used as a surrogate chemical based on similar chemical structure and toxicological properties.

[i] p-cresol used as a surrogate chemical based on similar chemical structure and toxicological properties.

[j] Pyrene used as a surrogate chemical based on similar chemical structure and toxicological properties.

[k] Anthracene used as a surrogate chemical based on similar chemical structure and toxicological properties.

[l] Chlordane (technical) used as a surrogate chemical based on similar chemical structure and toxicological properties.

[m] Endrin used as a surrogate chemical based on similar chemical structure and toxicological properties.

[n] Source: ADEC (2000) guidance.

2.7.2.6 Risk Characterization

This section of the risk assessment combines the results of the exposure assessment with the toxicity criteria identified for the COCs and pathways. Carcinogenic risks and noncarcinogenic impacts for each COC are presented for all populations and media of interest, including both current and future land and other resource use settings. Cumulative risks, including all COCs and pathways, for all relevant pathways and populations are also described. These risk estimates are summarized in Table 2-6. The results of the HHRA are interpreted within the context of the CERCLA acceptable risk range at SS011 and PCB/PCE contamination at SS008; within the context of risk-based cleanup levels (RBCLs) determined in the HHERA for soil at SS003 and SS008; 18 AAC 75 Method Two for soil at LF004; and within the context of 18 AAC 75 Table C for groundwater at SS003, SS008, and LF004.

The major uncertainties affecting the risk assessment are also presented in this section, including uncertainties related to sampling and analysis, environmental fate and transport modeling, the use of default exposure assumptions, and those associated with the toxicity criteria.

For carcinogens, risks are generally expressed as the incremental probability of an individual's likelihood of developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$Risk = CDI \times SF$$

Where:

Risk = a unitless probability (e.g., 2×10^{-5}) of an individual's likelihood of developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(mg/kg\text{-}day)^{-1}$

These risks are probabilities that usually are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes – such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. The EPA's generally acceptable risk range for site-related exposure is 10^{-4} to 10^{-6} (1 in 10,000 to 1 in 1,000,000).

Tables 2-7, **2-8**, and **2-9** summarize the scenarios where the cumulative risk exceeded ADEC risk criteria for SS003, SS008, and SS011.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a RfD derived for a similar exposure period. An RfD represents a daily individual intake that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of site-related daily intake to the RfD is called a hazard quotient (HQ).

Table 2-7 SS003 - Summary of Human Health Risk Estimates for Human Receptors

Media	Site Worker				Site Worker/Recreational Hunter				Trench Worker				Site Visitor			
	Current		Future		Current		Future		Current		Future		Current		Future	
	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI
Non-PHC																
Surface Soil	1E-05	**5**	1E-05	**5**	**2E-05**	**5**	**2E-05**	**5**	7E-07	**5**	7E-07	**5**	7E-07	0.3	7E-07	0.3
Subsurface Soil	3E-06	0.5	3E-06	0.5	3E-06	0.6	3E-06	0.6	1E-07	0.5	1E-07	0.5	2E-07	0.03	2E-07	0.03
Sediment	8E-06	0.3	8E-06	0.3	1E-05	0.4	1E-05	0.4	5E-07	0.4	5E-07	0.4	4E-07	0.02	4E-07	0.02
Subsurface Water	NA	NA	**2E-04**	**3**	NA	NA	**2E-04**	**3**	NA	NA	6E-06	**3**	NA	NA	6E-06	0.1
Non-PHC Cumulative Media ILCR/HI:	**2E-05**	**6**	**2E-04**	**8**	**3E-05**	**6**	**2E-04**	**9**	1E-06	**6**	8E-06	**9**	1E-06	0.3	8E-06	0.4
PHC																
Surface Soil	NA	0.1	NA	0.1	NA	0.3	NA	0.3	NA	0.3	NA	0.3	NA	0.007	NA	0.007
Subsurface Soil	NA	0.07	NA	0.07	NA	0.1	NA	0.1	NA	0.1	NA	0.1	NA	0.004	NA	0.004
Sediment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Subsurface Water	NA	NA	NA	**3**	NA	NA	NA	**3**	NA	NA	NA	**3**	NA	NA	NA	0.1
PHC Cumulative Media ILCR/HI:	NA	0.2	NA	**3**	NA	0.4	NA	**3**	NA	0.4	NA	**3**	NA	0.01	NA	0.1
ADEC Risk Criteria:	10^{-5}	1														
EPA Risk Range:	$10^{-6} – 10^{-4}$	1														

Notes:
% - percent
ADEC - Alaska Department of Environmental Conservation
EPA – U. S. Environmental Protection Agency
HI – Hazard Index.
ILCR – Incremental lifetime cancer risk.
NA – not applicable
PHC – Petroleum hydrocarbon

Bold indicates exceedence of the EPA's risk management range and/or ADEC acceptable risk criteria.

Table 2-8 SS008 – Summary of Human Health Risk Estimates for Human Receptors

Media	Site Worker				Site Worker/Recreational Hunter				Trench Worker				Site Visitor			
	Current		Future		Current		Future		Current		Future		Current		Future	
	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI
Non-PHC																
Surface Soil	**2E-05**	0.3	**2E-05**	0.3	**3E-05**	0.4	**3E-05**	0.4	1E-06	0.4	1E-05	0.4	1E-06	0.02	1E-06	0.02
Subsurface Soil	8E-06	0.2	8E-06	0.2	1E-05	0.3	1E-05	0.3	5E-07	0.4	5E-07	0.4	4E-07	0.01	4E-07	0.01
Sediment	8E-06	0.3	8E-06	0.3	1E-05	0.4	1E-05	0.4	6E-07	0.5	6E-07	0.5	5E-07	0.02	5E-07	0.02
Groundwater	NA	NA	**1E-03**	**60**	NA	NA	**1E-03**	**60**	NA	NA	**5E-05**	**60**	NA	NA	**5E-05**	**2**
Non-PHC Cumulative Media ILCR/HI:	**4E-05**	0.9	**1E-03**	**61**	**5E-05**	1	**1E-03**	**61**	2E-06	1	**5E-05**	**61**	2E-06	0.05	**5E-05**	**2**
PHC																
Surface Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Subsurface Soil	NA	0.02	NA	0.02	NA	0.3	NA	0.3	NA	0.3	NA	0.3	NA	0.009	NA	0.009
Sediment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Groundwater	NA	NA	NA	**18**	NA	NA	NA	**18**	NA	NA	NA	**18**	NA	NA	NA	0.7
PHC Cumulative Media ILCR/HI:	NA	0.2	NA	**18**	NA	0.4	NA	**18**	NA	0.3	NA	**18**	NA	0.009	NA	0.4

Key:
ADEC – Alaska Department of Environmental Conservation
HI – Hazard Index
ILCR – incremental lifetime cancer risk
NA – not applicable
PHC – petroleum hydrocarbon
Bold indicates exceedence of ADEC's acceptable risk criteria: 1E-05 for carcinogenic risk and a non-carcinogenic HI of 1.

Table 2-9 SS011 – Summary of Human Health Risk Estimates for Human Receptors

Media	Site Worker				Site Worker/Recreational Hunter				Trench Worker				Site Visitor			
	Current		Future		Current		Future		Current		Future		Current		Future	
	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI	ILCR	HI
Non-PHC																
Surface Soil	**2E-03**	**14**	**2E-03**	**14**	**3E-03**	**15**	**3E-03**	**15**	**1E-04**	**14**	**1E-04**	**14**	**1E-04**	0.8	**1E-04**	0.8
Subsurface Soil	**2E-05**	0.1	**2E-05**	0.1	**4E-05**	0.2	**4E-05**	0.2	1E-06	0.2	1E-06	0.2	1E-06	0.008	1E-06	0.008
Sediment	3E-06	0.02	3E-06	0.02	6E-056	0.03	6E-056	0.03	2E-07	0.03	2E-07	0.03	2E-07	0.001	2E-07	0.001
Non-PHC Cumulative Media ILCR/HI:	**2E-03**	**14**	**2E-03**	**14**	**5E-05**	**15**	**5E-05**	**15**	**1E-04**	**15**	**1E-04**	**15**	**1E-04**	0.8	**1E-04**	0.8
PHC																
Surface Soil	NA	1	NA	1	NA	**2**	NA	**2**	NA	**2**	NA	**2**	NA	0.06	NA	0.06
Subsurface Soil	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sediment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PHC Cumulative Media ILCR/HI:	NA	1	NA	1	NA	**2**	NA	**2**	NA	**2**	NA	**2**	NA	0.06	NA	0.06

Key:
ADEC – Alaska Department of Environmental Conservation
HI – Hazard Index
ILCR – incremental lifetime cancer risk
NA – not applicable
PHC – petroleum hydrocarbon
Bold indicates exceedence of ADEC's acceptable risk criteria: 1E-05 for carcinogenic risk and a non-carcinogenic HI of 1.

The HQ is calculated as follows:

$$\text{Non-cancer HQ} = \text{CDI}/\text{RfD}$$

Where: CDI = chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

An HQ less than or equal to 1 indicates that a receptor's dose of a single contaminant is less than or equal to the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely.

The Hazard Index (HI) is generated by adding the HQs for all COCs and pathways at a site that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which an individual may reasonably be exposed. An HI less than or equal to 1 indicates that adverse effects are unlikely from additive exposure to site chemicals. An HI greater than 1 indicates that site-related exposures may present a risk to human health.

Risk Estimate Uncertainties

Environmental investigations conducted at ERP Sites SS003, SS008, and SS011 were based on site histories, known or suspected contaminant releases, and physical characteristics (i.e., the presence of waste materials or topographic anomalies) identified during preliminary site investigation activities. These environmental investigations focused on known or suspected sources of contamination, and included a tiered approach to collecting and analyzing field screening and fixed laboratory samples of soil, sediment, surface water, and subsurface water between 1997 and 2007. Due to the biased nature of the sampling (e.g., the surface soil samples collected at SS011 in 2007 were collected directly beneath leaking drums and most likely represent the highest concentrations of contaminants at the site), the contaminant characterization is expected to result in a protective assessment of potential risks. Nevertheless, a degree of uncertainty remains in the characterization of contamination associated with SS003, SS008, and SS011, because it is not practicable to sample all areas of Lower Camp and downgradient areas.

The process used in selecting site COPCs may introduce a degree of uncertainty in the HHRA. However, protective methods and assumptions were used in selecting COPCs, in accordance with State of Alaska regulations (18 AAC 75). Protective assumptions used in the COPC screening procedure included comparison of maximum detected chemical concentrations to one-tenth of the most protective screening criteria for the ingestion or inhalation exposure pathways listed in 18 AAC 70 and 18 AAC 75. Chemicals without risk-based screening benchmarks were screened based on toxicity information for surrogate chemicals to the extent appropriate. Chemicals that exceeded criteria and benchmarks, and chemicals without screening benchmarks or appropriate surrogates, were proposed for further evaluation in the Tier II baseline HHRA for SS003, SS008, and SS011.

As part of the data review, a comparison of method reporting limits (MRLs) to screening criteria was conducted. This evaluation concluded that there were elevated MRLs for PAHs in two surface soil samples (07TATSS11004 and 07TATSS11008) collected from SS011. However,

these cases were limited to samples with high concentrations of DRO and/or RRO; presumably, due to matrix interference caused by high concentrations of PHCs. In the case of Sample 07TATSS11004, all PAHs were detected results at concentrations above their MRLs; so this issue had no impact on COPC or COPEC selection. In the case of Sample 07TATSS11008, three PAHs (i.e., benzo(a)anthracene, benzo(a)pyrene, and naphthalene) were non-detect with elevated MRLs. However, maximum detected concentrations of these chemicals in surface soil at SS011 were above MRLs for Sample 07TATSS11008, and they were selected as COPCs and/or COPECs for surface soil at SS011 based on results for other samples.

No uncertainty analysis is available for LF004.

2.7.3 Summary of Ecological Risk Assessment

This section summarizes the approaches and findings of the ERA that has been performed at ERP Sites SS003, SS008, and SS011. An ERA estimates the likelihood that adverse ecological effects (e.g., mortality, reproductive failure) will occur as a result of a release of a hazardous substance at a Superfund site. The purpose for conducting the ERA is to: 1) identify and characterize the current and potential threats to the environment from a hazardous substance release, 2) evaluate the ecological impacts of alternative remediation strategies, and 3) establish clean-up levels that will protect the natural resources at risk. An ERA is a qualitative and/or quantitative appraisal of the actual or potential effects of site releases on plants and animals. The ERA identified unacceptable risks associated with chemicals present at SS003, SS008, and SS011.

A risk assessment completed in 1997 for LF004 determined ecological risk drivers to be 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT. These analytes are breakdown products from pesticides that were applied at Tatalina LRRS.

The COCs associated with unacceptable site risk (if any) are identified, as well as the receptors and exposure pathways of primary concern. Based on the presence of unacceptable risks to mammalian and avian species, remedial action is being recommended to reduce the risks.

2.7.3.1 Identification of Chemicals of Ecological Concern

This section identifies those chemicals associated with unacceptable risk at a site and that are the basis for the proposed remedial action. Although other chemicals were detected at a site, these COCs are the primary risk-driving chemicals. The detection frequency, range of detected concentrations, and exposure point concentrations (EPCs) for chemicals and media of concern are presented in **Tables 2-10**, **2-11**, and **2-12** for SS003, SS008, and SS011, respectively.

2.7.3.2 Exposure Assessment

This section describes the ecological setting on and near these ERP sites and types of habitat present, including any ecologically sensitive areas that have been identified. The key species at the sites are identified, including any Federal or State designated rare, endangered, or threatened species. Complete exposure pathways and chemical-specific EPCs for each receptor of interest

Table 2-10 SS003 - Summary of Chemicals of Ecological Concern and Medium-Specific EPCs

Media	Chemical of Ecological Concern	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Surface Soil[1]	Total Xylenes	0.0081	2,600	100	2,600
	DRO	8.6	38,000	78	14,251
	GRO	0.95	3,500	39	629
	RRO	12	1,260	92	605
Sediment[1]	Bis(2-ethylhexyl)phthalate	0.9	0.9	100	0.90

Key:
1 – Concentrations reported in milligrams per kilogram (mg/Kg).
DRO – diesel range organics
EPC – exposure point concentration
GRO – gasoline range organics
RRO – residual range organics

Table 2-11 SS008 - Summary of Chemicals of Ecological Concern and Medium-Specific EPCs

Media	Chemical of Ecological Concern	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Surface Soil[1]	Arochlor 1260	0.02	17	88	11.50
	DRO	4	2,500	100	2,159
	GRO	0.98	630	100	630
	RRO	43	529	100	529
Sediment[1]	DRO	25.6	2,740	83	2,506
	RRO	119	1,190	100	871
	PCE	0.294	0.294	33	NC

Key:
1 – Concentrations reported in milligrams per kilogram (mg/Kg).
DRO –diesel range organics
EPC – exposure point concentration
GRO – gasoline range organics
NC – not calculated
PCE – tetrachloroethene
RRO – residual range organics

Table 2-12 SS011 - Summary of Chemicals of Ecological Concern and Medium-Specific EPCs

Media	Chemical of Ecological Concern	Concentration Detected		Frequency of Detection (percent)	EPC
		Minimum	Maximum		
Surface Soil[1]	Acenaphthene	0.0011	9,200	56	2,800
	Anthracene	0.0018	7,300	50	2,230
	Benzo(a)anthracene	0.0068	3,100	50	950
	Benzo(a)pyrene	0.0068	1,800	39	286
	Benzo(b)fluoranthene	0.019	2,300	50	705
	Benzo(g,h,i)perylene	0.0063	740	44	229
	Benzo(k)fluoranthene	0.0085	790	36	166
	Chrysene	0.049	3,500	56	1,066
	Dibenz(a,h)anthracene	0.0025	210	33	34
	Fluoranthene	0.017	10,000	50	3,063
	Fluorene	0.0028	5,700	50	1,744
	Indeno(1,2,3-cd)pyrene	0.0070	640	33	103
	2-Methylnaphthalene	0.037	8,600	46	3,697
	Naphthalene[2]	0.0016	13,000	55	3,555
	Phenanthrene	0.012	17,000	56	5,177
	Pyrene	0.036	10,000	67	3,029
	Endrin	0.0018	3.5	29	0.61
	Endrin aldehyde	0.00037	2.9	71	0.94
	Endrin ketone	0.0026	2.2	44	0.75
	DRO	19	200,000	100	79,575
	RRO	104	160,000	100	60,057
Sediment[1]	RRO	236	342	100	342

Key:
1 – Concentrations reported in milligrams per kilogram (mg/Kg).
2 – Non-cancer Hazard Index
EPC – exposure point concentration
DRO – diesel range organics
RRO – residual range organics

are also presented. The results of any field studies that have been conducted, as well as the assumptions, approaches, and results of any exposure modeling are presented.

The ecological exposure analysis begins with development of a site-specific CEM. The CEM for SS003, SS008, and SS011, in turn, was based on information provided in the Ecological Checklist. The CEM is a descriptive and graphical presentation of relationships between chemical contaminants and potentially exposed receptors. The ecological CEM identifies chemical sources, ecological habitats and receptors, and complete exposure pathways between

contaminant sources and ecological resources. These sites identify three former Lower Camp areas of Tatalina LRRS where POL and other potential contaminants were released.

A variety of herbivorous or omnivorous birds and mammals occur in the vicinity of Tatalina LRRS, including: dark-eyed junco (*Funco hyemalis*), Say's phoebe (*Sayornis saya*), American robin (*Turdus migratorius*), Swainson's thrush (*Catharus ustalatus*), Northern shrike (*Laninus excubitor*), tundra vole (*Microtus oeconomus*), and least weasel (*Mustela rixosa*). These consumer-level species potentially serve as prey for the: great horned owl (*Bubo viginianus*), Northern hawk owl (*Surnia ulula*), red fox (*Vulpes vulpes*), North American lynx (*Lynx canadensis*), and brown bear (*Ursus arctos*), which have also been observed at Tatalina LRRS.

Lower Camp in the vicinity of SS003, SS008, and SS011 is highly disturbed, with discontinuous grassy areas. The area to the north and northeast of SS008 is heavily vegetated with brush or stands of alders and low willows, and is continuous with vegetation within SS008 on the north side. No fences restrict access of ecological receptors to SS003, SS008, and SS011 – allowing potential exposure of ecological receptors inhabiting the area to soil COPECs. Therefore, the vegetated portions of SS003, SS008, and SS011 may provide habitat or forage for various herbivorous, omnivorous, and carnivorous birds and mammals.

As depicted in the ecological CEM for SS003, SS008, and SS011 (Figures 2-4, 2-6 and 2-8), exposure pathways between soil COPECs and terrestrial birds and mammals are complete. These exposure pathways include direct contact pathways (i.e., incidental soil ingestion, dermal contact with soil, and inhalation of dust), as well as uptake by biota (i.e., plants and animals) and food chain transfer.

Various ecological receptors (i.e., birds and mammals) may consume surface water from the ephemeral drainage channels, creeks, and seeps at SS003, SS008, or SS011. However, many of these surface water bodies are seasonal or ephemeral in nature and, therefore, are not likely to support aquatic receptors. Surface water drainage at Lower Camp flows downgradient towards the Tatalina River. The area drainage originating from the southeastern side passes through the eastern border of Lower Camp, continues on the northern side of the ridge and eventually enters the Tatalina River. The other area drainage, originating from the south region, west of Lower Camp, passes through the south side of Lower Camp, merges with another creek from the Northern watershed and eventually enters the Tatalina River. During the 1997 RI, no surface water was observed in the southern drainage, but some surface water was observed in the southeastern drainage. Therefore, exposure pathways for any aquatic receptors (i.e., fish and macroinvertebrates) in the Tatalina River are deemed potentially complete, but insignificant, because uptake by fish is not expected to be significant, given the low potential for contaminants at concentrations of concern in this offsite river.

As depicted in the ecological CEM for SS003, SS008, and SS011, exposure pathways between surface water COPECs and terrestrial birds and mammals are complete for direct contact pathways of surface water ingestion and incidental surface water ingestion. Additionally, the ecological CEM for SS003, SS008, and SS011 indicates exposure pathways between sediment COPECs and terrestrial birds and mammals are complete for direct contact pathways (i.e., incidental sediment ingestion and dermal contact with sediment). COPECs were identified for

soil, sediment, and surface water. Secondary sources of potential exposure were identified as ambient air, soil, sediment, and surface water in the ecological CEM.

2.7.3.3 Ecological Effects Assessment

This section summarizes the results of any toxicity tests or field studies conducted to evaluate adverse ecological effects. In addition, the assessment and measurement endpoints developed for this site are presented.

Ecological hazards for PHCs were evaluated based on the use of sampling results for specific indicator chemicals (e.g., PAHs and BTEX). Although ADEC has developed RfDs for individual PHC fractions, these toxicity values were developed based on the protection of human health. Therefore, they were not used to evaluate ecological receptors. In addition to the evaluation of indicator chemicals, as described above, potential impacts of PHC mixtures (such as DRO) were evaluated through the use of toxicity reference values (TRVs) for surrogate compounds (e.g., naphthalene).

Assessment endpoints focus the ERA on the guild or community that might be adversely affected by exposure to a COPEC. As defined in EPA guidelines (USEPA, 1998a), an assessment endpoint is an explicit expression of the environmental value that is to be protected (for example, growth, survival, and reproduction of a specific species population). A measurement endpoint is defined as a quantitative expression of an observed or measured effect of the hazard; that is, a measurable response to a stressor related to the ecological characteristic chosen as the assessment endpoint (USEPA, 1998). Assessment and measurement endpoints selected for ecological receptors at SS003, SS008, and SS011 are described in the following subsections.

2.7.4 Ecological CEM

The ecological CEMs for ecological habitats and receptors are graphically presented on Figures 2-9, 2-11, and 2-13 for SS003, SS008, and SS011, respectively. These ecological CEMs are discussed below for surface soil, surface water, and sediment. Ecological receptors are not likely to come in contact with subsurface soil or subsurface water; therefore, these pathways are considered to be potentially complete, but insignificant. The ecological CEM was based, in part, on the site-specific Ecological Checklist prepared for Lower Camp.

2.7.4.1 Surface and Subsurface Soils

Based on results of ecological screening, COPECs identified for SS003 surface soil include: inorganics, VOCs, SVOCs, DRO, GRO, and RRO. COPECs identified for SS008 surface soil include: inorganics, 1,3,5-trimethylbenzene, carbon disulfide, PCE, trichlorofluoromethane, SVOCs, DDT-related pesticides, and Arochlor 1260, DRO, GRO and RRO. COPECs identified for SS011 surface soil: include inorganics, VOCs, SVOCs (including PAHs), pesticides (including DDT-related pesticides), DRO, GRO and RRO (USAF, 2009a). With the exception of DDT and its breakdown products (i.e., DDD and DDE), none of these COPECs tend to bioaccumulate in terrestrial organisms (ATSDR, 1989; Eisler, 1987). The presence of DDT and its breakdown products in various media at Tatalina LRRS may be attributable to historic

application of DDT at Tatalina LRRS for insect control (USAF, 1998b). However, DDT and its breakdown products will be carried through the ERA and considered for cumulative hazard purposes, as appropriate.

Lower Camp in the vicinity of SS003, SS008, and SS011 is highly disturbed, with discontinuous grassy areas. The area to the north and northeast of SS008 is heavily vegetated with brush or stands of alders and low willows, continuous with vegetation within SS008 on the north side. The vegetated portions of SS003, SS008, and SS011 may provide habitat or forage for various herbivorous, omnivorous, and carnivorous birds and mammals. No fences restrict access of ecological receptors to SS003, SS008, and SS011, allowing potential exposure of ecological receptors inhabiting the area to soil COPECs.

As depicted in the ecological CEM for SS003, SS008, and SS011 (Figures 2-9, 2-11, and 2-13, respectively), exposure pathways between soil COPECs and terrestrial birds and mammals are complete. These exposure pathways include direct contact pathways (i.e., incidental soil ingestion, dermal contact with soil, and inhalation of dust), as well as uptake by biota (i.e., plants and animals) and food chain transfer.

2.7.4.2 Surface Water and Sediment

Based on results of ecological screening, COPECs identified for SS003 surface water includes barium, titanium, diethylphthalate, and DRO. COPECs identified for SS008 surface water include inorganics, VOCs, and DDT. COPECs identified for SS011 surface water includes barium, chromium, carbon disulfide, and chloromethane.

Based on results of ecological screening, COPECs identified for SS003 sediment include inorganics, VOCs, SVOCs, DDT-related compounds, DRO, and GRO. COPECs identified for SS008 sediment include inorganics, VOCs, SVOCs (including PAHs), DDD, DDT, Arochlor 1260, DRO, GRO, and RRO. COPECs identified for SS011 sediment include inorganics, DDT, and RRO.

Major assumptions about exposure frequency, duration, and other exposure factors that were included in the exposure assessment are included in the HHERAs at SS003, SS008, and SS011 (USAF, 2009a). This level of detail was not provided for LF004.

2.7.4.2.1 Terrestrial Habitats

Contaminants at SS003, SS008, and SS011 may enter plant tissues by root uptake of COPECs in soil and water, by air-to-plant transfer of COPECs in vapor form, and through diffusion of COPECs directly deposited on the leaves as dust. Revegetation has occurred to some degree in areas of SS003, SS008, and SS011 where structures have been demolished and removed, such as in the SS008 area. Lower Camp in the vicinity of SS003, SS008, and SS011 is highly disturbed, with discontinuous grassy areas. The area to the north and northeast of SS008 is heavily vegetated with brush or stands of alders and low willows, and is continuous with vegetation within SS008 on the north side. The vegetated portions of SS003, SS008, and SS011 may provide habitat or forage for various herbivorous, omnivorous, and carnivorous birds and

mammals. No fences restrict access of ecological receptors to SS003, SS008, and SS011, allowing potential exposure of ecological receptors inhabiting the area to soil COPECs.

Consistent with ADEC guidance (ADEC, 2005), and the ecological CEM for Lower Camp Sites SS003, SS008, and SS011, appropriate assessment endpoints for SS003, SS008, and SS011 are as follows:

- The potential for significant adverse effects on terrestrial soil plant species abundance, diversity, and primary production (i.e., plants that obtain nutrients primarily from soil).
- The potential for significant adverse effects on soil invertebrate community abundance and diversity (i.e., all terrestrial invertebrates).
- The potential for significant adverse effects on terrestrial avian herbivore abundance and diversity (e.g., dark-eyed junco).
- The potential for significant adverse effects on terrestrial mammalian herbivore abundance and diversity (e.g., tundra vole).
- The potential for significant adverse effects on terrestrial avian invertivore abundance and diversity (e.g., American robin).
- The potential for significant adverse effects on terrestrial mammalian invertivore abundance and diversity (e.g., masked shrew).
- The potential for significant adverse effects on terrestrial avian carnivore abundance and diversity (e.g., northern shrike).
- The potential for significant adverse effects on terrestrial mammalian carnivore abundance and diversity (e.g., least weasel, mink).
- The potential for significant adverse effects on terrestrial avian omnivore abundance and diversity (e.g., mallard).

A measurement endpoint is defined as a quantitative expression of an observed or measured effect of the hazard; that is, a measurable response to a stressor related to the ecological characteristic chosen as the assessment endpoint (USEPA, 1998). To evaluate the potential for significant adverse effects of soil COPECs on terrestrial soil plant and invertebrate communities, soil concentrations were compared with phytotoxicity benchmarks and earthworm/soil organism benchmarks, respectively. This comparison was performed as part of the Tier I screening ERA process for SS003, SS008, and SS011. To evaluate the potential for significant adverse effects of soil COPECs on the remaining, higher trophic level organisms, COPEC concentrations in abiotic media (i.e., soil and surface water) and biotic media (i.e., plant and animal tissues) were used to model exposure doses for comparison to TRVs.

2.7.4.2.2 Aquatic Wetland Habitats

Aquatic and/or wetland species are not anticipated to be significantly impacted by COPECs present at SS003, SS008, and SS011. Although water soluble COPECs (e.g., BTEX) in soil, or lipophilic COPECs (e.g., PAHs) sorbed to sediment particles or organic matter, can theoretically be transported to surface water bodies and sediment via snowmelt and rainfall runoff, surface

water bodies in the vicinity of these Lower Camp areas include creeks that are only present intermittently. This suggests that adverse impacts to aquatic and wetland receptors is not occurring, given that the ephemeral surface water bodies at SS003, SS008, and SS011 do not support fish, and are unlikely to support other aquatic organisms.

Surface water drainage at Lower Camp flows in a generally southeastern direction towards the Tatalina River. During the 1997 RI, no surface water was observed in the southern drainage, but some surface water was observed in the southeastern drainage. Therefore, exposure pathways for aquatic receptors (i.e., fish and macroinvertebrates) in the Tatalina River are deemed potentially complete, but insignificant, because uptake by fish is not expected to be significant, given the low potential for COPECs at this offsite river.

Based on the above, adverse impacts of SS003, SS008, and SS011 COPECs on aquatic and wetland receptors are not anticipated. Therefore, assessment and measurement endpoints for aquatic and wetland species were identified, but were not evaluated in the ERA.

2.7.4.3 Ecological Risk Characterization

This section presents a brief summary of the environmental risks identified at the ERP Sites, the basis for the risks, how the risks were determined, and COC concentrations that are expected to protect ecological receptors.

Ecological risk characterization integrates results of the exposure dose analysis and the effects assessment. For higher trophic level receptors, estimated exposure doses for each chemical and indicator receptor were compared to ecological TRVs to calculate a chemical-specific HQ. The equation for calculating the HQ is:

$$HQ = \frac{Dose}{TRV}$$

Where: HQ = Hazard quotient (unitless).
Dose = Modeled exposure dose for indicator species (mg/Kg-day).
TRV = Toxicity reference value for the indicator species (mg/Kg-day).

The HQ value scheme is derived from toxicity testing in an aquatic framework, and a high HQ may not necessarily mean that representative ecological receptors are experiencing adverse health effects. For example, TRVs used in predictive ERAs are typically no observable adverse effect level (NOAEL)-based. Therefore, environmental exposures higher than the TRV may be without adverse effect.

HQ values exceeding 1.0 are generally considered to be indicative of potential biological or ecological effects on representative receptors. HQ values above 1.0 do not necessarily indicate that a biological or ecological effect will occur, only that a lower threshold has been exceeded (Menzie et al., 1992). Evaluating the significance of HQ values was conducted in a manner generally consistent with Menzie et al. (1992):

- HQ less than 1: no adverse effects on representative receptors.
- HQ between 1 and 10: limited potential for adverse effects on representative receptors.
- HQ between 10 and 100: potentially adverse effects on representative receptors.
- HQ exceeds 100: significant potential for adverse effects on representative receptors.

Note that these HQ ranges and anticipated outcomes are only guidelines. Site-specific factors such as spatial distribution and detection frequency of COPECs, uncertainty of assumptions used in exposure determination, and study endpoint used to determine toxicity benchmarks were considered when reviewing specific HQs.

In order to evaluate potential cumulative effects of exposure to multiple COPECs, ecological HIs were calculated for COPECs having similar mechanisms of action or within specific chemical classes. Cumulative HI estimates were calculated as the sum of individual HQ estimates for COPECs with a similar mechanism of action, or from a specific chemical class. Only COPECs with individual HQ estimates greater than or equal to 0.1 were included in the cumulative HI estimate; COPECs with HQs less than 0.1 were deemed not to contribute significantly to the cumulative HI and were excluded from this calculation. Cumulative HI estimates were calculated for the following mechanisms of action (based on the toxicology of COPECs with HQ estimates greater than 0.1): growth/body weight changes, reproductive/developmental effects, and liver/kidney effects. In addition, cumulative HI estimates were calculated for the following chemical classes: PAHs, chlorinated pesticides, PCBs, and PHCs.

The ADEC risk management level is set at an ecological HI of 1. Consistent with ADEC guidance (ADEC, 2005), chemicals and sites associated with ecological HI estimates greater than 1 are retained for further evaluation. Options for further evaluation of sites with ecological HI estimates in excess of 1 may include, but are not limited to, ecological field validation studies, additional investigations of ambient conditions, or remedial options. Sites where HI estimates are less than 1 for all receptors, and uncertainties are acceptable, will be proposed for cleanup complete with institutional controls (CCIC) or no further response action planned (NFRAP) in regard to ecological concerns.

Risk Estimate Uncertainties

Environmental investigations conducted at ERP Sites SS003, SS008, and SS011 were based on site histories, known or suspected contaminant releases, and physical characteristics (i.e., the presence of waste materials or topographic anomalies) identified during preliminary site investigation activities. These environmental investigations focused on known or suspected sources of contamination, and included a tiered approach to collecting and analyzing field screening and fixed laboratory samples of soil, sediment, surface water, and subsurface water between 1997 and 2007. Due to the biased nature of the sampling (e.g., the surface soil samples collected at SS011 in 2007 were collected directly beneath leaking drums and most likely represent the highest concentrations of contaminants at the site), the contaminant characterization is expected to result in a protective assessment of potential risks. Nevertheless, a degree of uncertainty remains in the characterization of contamination associated with SS003, SS008, and SS011, because it is not practicable to sample all areas of Lower Camp and downgradient areas.

Biological investigations, including monitoring mammals or birds that may be directly exposed to contaminants present at Lower Camp, have not been conducted. Contract personnel may engage in hunting or fishing activities during non-work hours. Caribou, moose, bears, and other animals forage within Tatalina LRRS and may briefly come into contact with contaminated soils at SS003, SS008, or SS011. However, large game animals are widely roaming species that would have relatively infrequent and limited contact with media at Lower Camp. The potential for exposure of contract personnel to soil COPCs through harvesting of wild game is deemed to be potentially complete, but insignificant, and lack of chemical monitoring data for such species is believed to represent a low uncertainty.

The specific process used in the selection of site COPECs for evaluation of risks to ecological receptors may also introduce a degree of uncertainty in the ERA. The State of Alaska does not list specific numeric criteria for screening environmental media for potential impacts to ecological receptors. However, State of Alaska regulations (18 AAC 70 and 18 AAC 75) and guidance documents do identify risk assessment procedures, sources of ecological screening benchmarks, and other information for the identification of site COPECs. Chemicals without risk-based screening benchmarks were screened based on ecotoxicity information for surrogate chemicals to the extent appropriate.

No uncertainty analysis is available for LF004.

2.7.5 Basis for Action

Based on the results of the HHERAs as summarized above, the response actions selected in this ROD are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances from SS003, SS008, SS011, and LF004 into the environment.

2.8 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) provide a general description of what the cleanup will accomplish. These goals typically serve as the design basis for the remedial alternatives that will be presented in the next section.

The RAOs for SS003 are:

- Prevent current and future site workers, trench workers, and recreational visitors exposure through the inhalation pathway to surface soil contaminated with 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene that exceed 1,400 mg/Kg and 510 mg/Kg, respectively.
- Prevent current and future site workers, trench workers, and recreational visitors exposure through the ingestion and dermal contact pathways to groundwater contaminated with benzene, bis(2-chloroethyl) ether, and hexachlorobutadiene that exceed ADEC Table C cleanup levels.

- Prevent current and future site workers, trench workers, and recreational visitors exposure through the ingestion pathway to groundwater contaminated with PHCs (DRO, GRO, and RRO) that exceed ADEC Table C cleanup levels.
- Prevent mammalian and avian species exposure through the ingestion pathway to surface soil contaminated with total xylenes, DRO, GRO, and RRO that exceed 2,029 mg/Kg, 1,000 mg/Kg, 347 mg/Kg, and 11,000 mg/Kg, respectively.
- Prevent mammalian and avian species exposure through the ingestion pathway to sediment contaminated with bis(2-ethylhexyl) phthalate that exceeds 0.19 mg/Kg.

The RAOs for SS008 are:

- Prevent current and future human and ecological receptor exposure through the ingestion and dermal contact pathways to surface and subsurface soil contaminated with PCBs that exceed 1 mg/Kg.
- Prevent current and future site workers, trench workers, and recreational visitors exposure through the ingestion pathway to groundwater contaminated with 2-methylnaphthalene, lead, and DRO that exceed ADEC Table C cleanup levels.
- Prevent mammalian and avian species exposure through the ingestion pathway to surface soil contaminated with DRO, GRO, and RRO that exceed 1,000 mg/Kg, 323 mg/Kg, and 11,000 mg/Kg, respectively.
- Prevent mammalian and avian species exposure through the ingestion pathway to sediment contaminated with PCE, DRO, and RRO that exceed 0.024 mg/Kg, 265 mg/Kg, and 22 mg/Kg, respectively.

The RAOs for SS011 are:

- Prevent current and future site workers, trench workers, and recreational visitors exposure through the dermal contact and VOC inhalation pathways to naphthalene that exceeds 81 mg/Kg.
- Prevent current and future site workers, trench workers, and recreational visitors exposure through the dermal contact pathway to 2-methylnaphthalene that exceeds 2,492 mg/Kg.
- Prevent current and future site workers, trench workers, and recreational visitors exposure through the ingestion pathway to DRO and RRO that exceed 12,500 mg/Kg and 22,000 mg/Kg, respectively.
- Prevent mammalian and avian species exposure through the ingestion pathway to surface soil contaminated with fluorine, naphthalene, endrin aldehyde, endrin ketone, DRO and RRO that exceed 1.549 mg/Kg, 3.356 mg/Kg, 0.119 mg/Kg, 0.119 mg/Kg, 12,500 mg/Kg, and 22,000 mg/Kg, respectively.
- Prevent mammalian and avian species exposure through the ingestion pathway to sediment contaminated with RRO that exceeds 36 mg/Kg.

The RAOs for LF004 are:

- Prevent ecological exposure to 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT that exceed 7.2 mg/Kg, 5.1 mg/Kg, and 7.3 mg/Kg, respectively.

These RAOs were developed based on the currently and reasonably anticipated future commercial/industrial land use, as described in Section 2.6.

These RAOs address the risks identified in the risk assessment by applying limited actions that will reduce human or environmental exposure to contamination, and prevent activities that may result in increased exposure or spread the extent of contamination.

2.9 DESCRIPTION OF ALTERNATIVES

The remedial alternatives considered for ERP Sites SS003, SS008, SS011, and LF004 were presented in the Proposed Plan (USAF, 2012) and are all summarized in **Table 2-13**.

Table 2-13 Summary of Remedial Alternatives Evaluated for ERP Sites SS003, SS008, SS011, and LF004

Alternative Designation	Alternative Description
SS003 and SS008 Surface Soil – Petroleum Hydrocarbons	No Action
	Institutional Controls
	Soil Cover
	Natural Attenuation
	Chemical Oxidation
	Off-site Disposal through Thermal Description
	Off-site Disposal through Landfilling
	Bioremediation (in-situ landfarming)
SS003 and SS008 Groundwater	No Action
	Institutional Controls
	Natural Attenuation
	Enhanced Bioremediation
	Active Pumping with Air Stripping
	Active Pumping with Granular Activated Carbon Filtration
SS008 Soil – PCBs and PCE	No Action
	Institutional Controls
	Soil Cover
	Excavation and Off-site Landfilling

Table 2-13 (Cont.) Summary of Remedial Alternatives Evaluated for ERP Sites SS003, SS008, SS011, and LF004

Alternative Designation	Alternative Description
SS011 Surface Soil	No Action
	Institutional Controls
	Natural Attenuation
	Chemical Oxidation
	Off-site Disposal through Thermal Desorption
	Off-site Disposal through Off-site Landfilling
	Bioremediation (biopile)
LF004 Soil and Groundwater	No Action
	Institutional Controls
	Institutional Controls with Long-Term Monitoring
	Off-site Disposal through Landfilling

Key:
PCB – polychlorinated biphenyl
PCE – tetrachloroethene

Each alternative evaluated is described in more detail including: remedy components, common elements and distinguishing features, and expected outcomes in the following sections.

A total of 12 alternatives were evaluated to address remediation at SS003, SS008, SS011, and LF004. Eight alternatives were developed to address PHC surface soil remediation at SS003 and SS008 and six alternatives were developed to address groundwater remediation at SS003 and SS008. Seven alternatives were developed to address surface soil remediation at ERP Site SS011 and four alternatives were developed to address soil and groundwater remediation at LF004. This section provides a summary overview of the components of those alternatives. The 12 alternatives include:

- **No Action.** CERCLA requires that the "No Action" alternative be evaluated to establish a baseline for comparison. Under this alternative, the Air Force would take no action at the site to prevent exposure to the soil and groundwater contamination. The No Action alternative assumes that the site would be left "as is" i.e., in its current condition. No Action is a response action selected when no additional remedial actions are necessary to protect human health and the environment. No Action status should be noted in Air Force and ADEC records.
- **ICs Only.** This alternative consists of a Notice of Environmental Contamination being placed in Land Records and the Base Master Plan. Detailed restrictions will also be included in the Base Master Plan. These restrictions will document the contamination and restrict use of the site for work, residential, and recreational uses to prevent disturbance of soil/subsurface soil and surface/groundwater. This would eliminate the exposure pathway that the unacceptable human risk determination is based on. However, this option would not prevent potential migration of contaminants from wind or water erosion and would not reduce leaching or runoff, nor would it reduce potential ecological risks.

- **Soil Cover.** This alternative consists of using local material to construct a cover for the areas that contain contaminants above the cleanup level to eliminate exposure to contaminated surface soil. Soil covers would be graded to promote drainage. The covers would require periodic monitoring to ensure they remain effective and might require maintenance if the integrity of the covers become diminished. ICs, in the form of a Notice in the Base Master Plan, and other notices in the Land Record, would be implemented and excavation in the affected areas would be prohibited.
- **Natural Attenuation.** This alternative consists of allowing native biological, physical, and chemical processes to reduce contaminant concentrations. The rate at which natural processes operate is highly variable, depending on the media, specific process, and site conditions. A key component of this approach is to consider and monitor multiple processes, as well as track the individual processes, in order to estimate the overall rate and extent of attenuation. This alternative would also be paired with the ICs alternative if selected.
- **Chemical Oxidation.** A strong oxidizing agent can be added to surface and subsurface soils to break chemical bonds in organic COCs. This is a chemical reaction that requires an oxidizing chemical (peroxide, permanganate, persulfate, or ozone) to come in contact with the contaminant. The chemical reaction occurs relatively quickly to destroy the contaminant. The breakdown products are carbon dioxide, water, and other harmless compounds – depending on the contaminant. The oxidant can be applied by mixing a reagent directly into the soil, thus eliminating low in-situ soil temperature as a limiting factor.
- **Off-site Disposal through Thermal Desorption.** This remediation alternative consists of excavating soil with contaminant concentrations exceeding cleanup levels and subsequent disposal by combustion. The soil would be shipped off-site after excavation for thermal treatment at a permitted facility. The soil is heated in a sealed combustion chamber to remove or desorb contaminants. PHCs are the contaminant most commonly remediated using this technology. Temperatures and residence times used in thermal desorption units volatilize the contaminants, which are then emitted to the atmosphere.
- **Off-site Disposal through Landfilling.** This remediation alternative consists of excavating soil with contaminant concentrations exceeding preliminary remediation goals (PRGs), and transporting the excavated soil to an off-site landfill or soil recycling and disposal facility. Most of the contaminants at the sites are PHCs, which could be landfilled at a number of permitted facilities. Soil containing CERCLA hazardous substances will be landfilled at a facility permitted to accept such wastes.
- **Bioremediation (in-situ landfarming).** This remediation alternative involves landfarming of soils where contaminant concentrations exceed the PRGs, which includes stimulation of aerobic microbial activity through aeration and/or application of minerals, nutrients, and moisture. This would result in a reduction of contaminant concentrations through volatilization and enhanced microbial metabolization of PHCs adsorbed to soil. For surface soil contamination, this can be accomplished in-situ without the need to excavate or relocate the soil.

- **Enhanced Bioremediation.** Adding oxygen to a groundwater source area can enhance bacterial metabolizing of PHCs and other non-halogenated organic compounds. To increase the dissolved oxygen concentration in groundwater, oxygen-releasing compounds (ORCs) are added that interact with water and slowly release oxygen into the water. The ORCs are placed in the saturated zone and allowed to react with water over an extended period. Increased dissolved oxygen concentrations would enhance bacterial growth in the saturated zone directly downgradient of the point where the ORCs are placed.
- **Active Pumping with Air Stripping.** Air is passed through extracted groundwater to volatilize contaminants. Groundwater would be extracted by vertical extraction wells. Air stripping is easy to implement and commercial systems are available and easy to install.
- **Active Pumping with Filtration using Granular Activated Carbon (GAC).** This remediation technology treats PHCs and volatile contaminants dissolved in water. The approach involves pumping groundwater from an area where contaminant concentrations exceed PRGs, and conveying that water to a GAC filter. The charcoal is sieved so that particle size is uniform. The GAC filter removes organic molecules dissolved in the water through adsorption. Periodic regeneration or replacement of the GAC filter is required.
- **Bioremediation (biopile).** The form of bioremediation most applicable to ex-situ treatment at Indian Mountain LRRS involves stockpiling excavated soil into a biopile. Oxygen and nutrients are added to the pile to promote attenuation of hydrocarbon concentrations through bacterial action. Land farming and land spreading could achieve similar results to biopiling, however, frequent tilling and storm water inspections are required for effective remediation which are difficult in practice at remote stations.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, the alternatives for SS008, SS011, and LF003 were evaluated using the nine criteria described in Section 121(a) &(b) of CERCLA and 40 CFR Section 300.430 (e) (9) (i) as cited in NCP §300.430(f)(5)(i). The alternatives for SS003 were also evaluated using the nine criteria described by the CERCLA process, although this is not a CERCLA site. These criteria are classified as threshold criteria, balancing criteria, and modifying criteria.

Threshold criteria are standards that an alternative must meet to be eligible for selection as a remedial action. There is little flexibility in meeting the threshold criteria – the alternative must meet them or it is unacceptable. The following are classified as threshold criteria:

- Overall protection of human health and the environment.
- Compliance with – or an applicable waiver of – Applicable or Relevant and Appropriate Requirements (ARARs).

Balancing criteria weigh the tradeoffs between alternatives. These criteria represent the standards upon which the detailed evaluation and comparative analysis of alternatives are based. In general, a high rating on one criterion can offset a low rating on another balancing criterion. Five of the nine criteria are considered balancing criteria:

- Long-term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, and Volume (TMV) Through Treatment
- Short-term Effectiveness
- Implementability
- Cost

Modifying criteria which may be considered to the extent that information is available during the FS, but can be fully considered only after public and regulator comments, are as follows:

- Community Acceptance
- State/Support Agency Acceptance

This section summarizes how well each alternative satisfies each evaluation criterion and indicates how it compares to the other alternatives under consideration.

2.10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or ICs.

2.10.1.1 ERP Site SS003 – Surface Soil

Five remedial alternatives considered for surface soil at SS003 are protective of overall human health and the environment by reducing or eliminating COC concentrations: Natural Attenuation, Chemical Oxidation, Bioremediation (in-situ landfarming), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling. A sixth alternative (Soil Cover) is protective of overall human health and the environment by preventing exposure to surface soil.

ICs would serve to reduce human exposure to surface soil, but would be less effective in preventing ecological receptor exposure. Under the No Action Alternative, natural processes would act on COCs, but the rate and extent of that attenuation would not be known.

2.10.1.2 ERP Site SS003 – Groundwater

Four remedial alternatives considered for groundwater at SS003 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. The alternative that involves pumping and air stripping would only affect volatile compounds, and thus, is only partially effective on the COCs identified at SS003.

ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area. Under the No Action alternative, natural processes would act on COCs, but the rate and extent of that attenuation would not be known.

2.10.1.3 ERP Site SS008 – Surface Soil PHCs

Five remedial alternatives considered for PHCs in surface soil at SS008 are protective of overall human health and the environment by reducing or eliminating COC concentrations: Natural Attenuation, Chemical Oxidation, Bioremediation (in-situ landfarming), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling. A sixth alternative (Soil Cover) is protective of overall human health and the environment by prevent exposure to surface soil.

ICs will serve to reduce human exposure to surface soil, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would act on COCs, but the rate and extent of that attenuation would not be known.

2.10.1.4 ERP Site SS008 – CERCLA Hazardous Substances in Soil

Four remedial alternatives were assessed for treating PCBs and PCE in the soil at SS008. The alternatives represent a range of protectiveness of overall human health and the environment. The Soil Cover and Off-site Disposal through Landfilling alternatives are the most protective, while the No Action alternative provides minimal protection. ICs will serve to reduce human exposure to PCBs and PCE in surface soil, but would be less effective in preventing ecological receptor exposure. The No Action alternative is not protective of the human health and the environment, while ICs would reduce human exposure to the areas impacted by PCBs and PCE.

2.10.1.5 ERP Site SS008 – Groundwater

Four remedial alternatives considered for groundwater at SS008 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. The alternative that involves pumping and air stripping would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS008.

ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area. Under the No Action alternative, natural processes would act on COCs, but the rate and extent of that attenuation would not be known.

2.10.1.6 ERP Site SS011 – Surface Soil

Five remedial alternatives considered for surface soil at SS011 are protective of overall human health and the environment by reducing or eliminating COC concentrations: Natural Attenuation, Chemical Oxidation, Bioremediation (biopiles), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling.

ICs will serve to reduce human exposure to surface soil, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would act on COCs, but the rate and extent of that attenuation would not be known.

2.10.1.7 ERP Site LF004 – Soil

Two remedial alternatives considered for soil at LF004 are protective of overall human health and the environment by reducing or eliminating COC concentrations: ICs with Long-term Monitoring and Off-site Disposal through Landfilling.

ICs will serve to reduce human exposure to soil and ecological receptor exposure to surface soil due to the existing soil cover. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP Section 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site (relevant) that their use is well-suited (appropriate) to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

ARARs fall into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are health-based or risk-management-based numbers that provide concentration limits for the occurrence of a chemical in the environment at agreed-upon points of compliance. Location-specific ARARs restrict activities in certain sensitive environments. Action-specific ARARs are activity-based or technology-based, and typically control remedial activities that generate hazardous wastes (such as with those covered under the RCRA). Offsite shipment, treatment and disposal of excavated contaminated soil invoke action-specific ARARs.

2.10.2.1 ERP Site SS003 – Surface Soil

There are no location-specific applicable requirements to the remedial alternatives evaluated for SS003. Action-specific applicable requirements for ICs are addressed by 18 AAC 75.375. Action-specific applicable requirements for Soil Cover, Natural Attenuation, Chemical Oxidation, Off-site Disposal through Thermal Desorption, Off-site Disposal through Landfilling, and Bioremediation are addressed by 18 AAC 75.320-.380. Action-specific applicable requirements for Off-site Disposal through Thermal Desorption and Off-site Disposal through Landfilling are also addressed by 18 AAC 70 (if there are waterbodies or wetlands in the area), 18 AAC 60, and 18 AAC 70.

All six of the remedial alternatives listed below are compliant with chemical-specific applicable requirements. The following three remedial alternatives either passively or actively attenuate COC concentrations: Natural Attenuation, Bioremediation (in-situ landfarming), and Chemical Oxidation. Two alternatives (Off-site Disposal through Thermal Desorption and Off-site Disposal through Landfilling) remove COCs from the environment and one alternative (Soil Cover) prevents exposure to surface soil in the attainment area.

ICs and the No Action alternative do not address chemical-specific applicable requirements as well as the alternatives listed above. ICs prevent exposure of humans to surface soil in the attainment area, but may not be effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.2.2 ERP Site SS003 – Groundwater

There are no location-specific applicable requirements to the remedial alternatives evaluated for SS003. Action specific applicable requirements for Enhanced Bioremediation, Pumping with Air Stripping, and Pumping with GAC Filtration are addressed in 18 AAC 75.320-.380. Four remedial alternatives considered for groundwater at SS003 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Pumping with Air Stripping, and Pumping with GAC Filtration. The alternative that involves pumping and air stripping would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS003. ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area.

ICs, Natural Attenuation, Enhanced Bioremediation, and Pumping with GAC Filtration are compliant with chemical-specific applicable requirements. Pumping with Air Stripping only partially addresses COCs identified for SS003. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.2.3 ERP Site SS008 – Surface Soil PHCs

There are no location-specific applicable requirements to the remedial alternatives evaluated for SS008. Action-specific applicable requirements for ICs are addressed by 18 AAC 75.375. Action-specific applicable requirements for Soil Cover, Natural Attenuation, Chemical

Oxidation, Off-site Disposal through Thermal Desorption, Off-site Disposal through Landfilling, and Bioremediation are addressed by 18 AAC 75.320-.380. Action-specific applicable requirements for Off-site Disposal through Thermal Desorption and Off-site Disposal through Landfilling are also addressed by 18 AAC 70 (if there are waterbodies or wetlands in the area), 18 AAC 60, and 18 AAC 70.

All six of the remedial alternatives listed below are compliant with chemical-specific applicable requirements. The following three remedial alternatives either passively or actively attenuate COC concentrations: Natural Attenuation, Bioremediation (in-situ landfarming), and Chemical Oxidation. Two alternatives (Off-site Disposal through Thermal Desorption and Off-site Disposal through Landfilling) remove COCs from the environment, and one alternative (Soil Cover) prevents exposure to surface soil in the attainment area.

ICs and the No Action alternative do not address chemical-specific applicable requirements as well as the alternatives listed above. ICs prevent exposure of humans to surface soil in the attainment area, but may not be effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.2.4 ERP Site SS008 – CERCLA Hazardous Substances in Soil

The Off-site Disposal through Landfilling remedial alternative removes PCBs and PCE from the environment, while the Soil Cover remedial alternative prevents exposure to contaminated soil in the attainment areas. ICs and No Action alternatives do not address chemical-specific ARARs; however, ICs reduce exposure of PCBs and PCE to human receptors.

2.10.2.5 ERP Site SS008 – Groundwater

There are no known location-specific ARARs applicable to the remedial alternatives evaluated for SS008. Action-specific ARARs for Enhanced Bioremediation, Pumping with Air Stripping, and Pumping with GAC Filtration are addressed in 18 AAC 75.320-.380. Four remedial alternatives considered for groundwater at SS008 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Pumping with Air Stripping, and Pumping with GAC Filtration. The alternative that involves pumping and air stripping would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS008. ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.2.6 ERP Site SS011 – Surface Soil

There are no location-specific or action-specific ARARs applicable to the remedial alternatives evaluated for SS011. The following three remedial alternatives either passively or actively attenuate COC concentrations: Natural Attenuation, Bioremediation, and Chemical Oxidation. Two alternatives (Off-site Disposal through Thermal Desorption and Off-site Disposal through

Landfilling) remove COCs from the environment. All five of the remedial alternatives listed above are compliant with chemical-specific ARARs.

ICs do not address chemical-specific ARARs as well as the alternatives listed above. ICs prevent exposure of humans to surface soil in the attainment area, but may not be effective in preventing ecological receptor exposure. The No Action alternative does not address any applicable requirements.

2.10.2.7 ERP Site LF004

One remedial alternative passively attenuates COC concentrations at LF004: (Long-term Monitoring with ICs), while one alternative (Off-site Disposal through Landfilling) would remove COCs from the environment. Both of the remedial alternatives listed above are compliant with chemical-specific applicable requirements. Action specific requirements for ICs are addressed by 18 AAC 75.320-.380.

ICs do not address chemical-specific applicable requirements as well as the alternatives listed above. ICs prevent exposure to humans to surface and subsurface soil in the attainment area, but may not be effective in preventing ecological receptor exposure to subsurface soil. The No Action alternative does not address any applicable requirements.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

2.10.3.1 ERP Site SS003 – Surface Soil

Five remedial alternatives considered for surface soil at SS003 are considered effective in reducing or eliminating COC concentrations in the long-term: Natural Attenuation, Chemical Oxidation, Bioremediation (in-situ landfarming), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling. A sixth alternative (Soil Cover) will effectively prevent exposure to surface soil. Therefore, each of these alternatives is considered highly effective for long-term effectiveness and permanence.

ICs will serve to reduce human exposure to surface soil, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.3.2 ERP Site SS003 – Groundwater

Four remedial alternatives considered for groundwater at SS003 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. The alternatives that involve active pumping may not permanently affect COC concentrations if the soil acting a secondary source is not remediated. Further, air stripping would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS003. ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area. Therefore, ICs, Natural Attenuation, and Enhanced Bioremediation were considered highly effective for long-term effectiveness and permanence. Active Pumping with Air Stripping and GAC Filtration are less effective because of possible rebound in concentrations after pumping is halted and the limited impact of air stripping.

Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known. The No Action alternative is not considered effective for long-term effectiveness and permanence.

2.10.3.3 ERP Site SS008 – Surface Soil PHCs

Five remedial alternatives considered for PHCs in surface soil at SS008 are considered effective in reducing or eliminating COC concentrations in the long-term: Natural Attenuation, Chemical Oxidation, Bioremediation (in-situ landfarming), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling. A sixth alternative (installing a Soil Cover) will effectively prevent exposure to surface soil. Therefore, each of these alternatives is considered highly effective for long-term effectiveness and permanence.

ICs will serve to reduce human exposure to surface soil, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.3.4 ERP Site SS008 – CERCLA Hazardous Materials in Soil

Three of the four remedial alternatives considered for treating PCBs and PCE in soil at SS008 are effective in reducing or eliminating potential receptor exposure in the long-term. Off-site Disposal through Landfilling will effectively remove the PCBs and PCE from the environment and Soil Cover will prevent exposure of human and ecological receptors. ICs will serve to reduce human exposure to PCBs and PCE in surface soil, but would be less effective in preventing ecological receptor exposure. Therefore, each of these alternatives is considered highly effective for long-term effectiveness and permanence. Under the No Action alternative, natural processes would be very slow to attenuate the PCBs. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.3.5 ERP Site SS008 – Groundwater

Four remedial alternatives considered for groundwater at SS008 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. The alternatives that involve active pumping may not permanently affect COC concentrations if the soil acting a secondary source is not remediated. Further, air stripping would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS008. ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area. Therefore, ICs, Natural Attenuation, and Enhanced Bioremediation were considered highly effective for long-term effectiveness and permanence. Active Pumping with Air Stripping and GAC Filtration are less effective because of possible rebound in concentrations after pumping is halted and the limited impact of air stripping.

Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.3.6 ERP Site SS011 – Surface Soil

Five remedial alternatives considered for surface soil at SS011 are considered effective in reducing or eliminating COC concentrations in the long-term: Natural Attenuation, Chemical Oxidation, Bioremediation (biopiles), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling.

ICs will serve to reduce human exposure to surface soil, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.3.7 ERP Site LF004

Two remedial alternatives considered for soil at LF004 are considered effective in reducing or eliminating COC concentrations in the long-term: Long-term Monitoring with ICs and Off-site Disposal through Landfilling.

ICs will serve to reduce human exposure to soil, but would be less effective in preventing ecological receptor exposure to subsurface soil. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of TMV through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

2.10.4.1 ERP Site SS003 – Surface Soil

Four remedial alternatives considered for surface soil at SS003 are considered effective in reducing COC TMV: Natural Attenuation, Chemical Oxidation, Bioremediation (in-situ landfarming), and Off-site Disposal through Thermal Desorption. ICs, No Action, Off-site Diposal through Landfilling, and Soil Cover alternatives are all ineffective in reducing COC TMV. Natural processes would attenuate COCs over time, but the rate and extent of that attenuation would not be known under the No Action or ICs alternatives due to the absence of monitoring.

2.10.4.2 ERP Site SS003 – Groundwater

Four remedial alternatives considered for groundwater at SS003 reduce or eliminate COC TMV: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. Natural Attenuation can take years to reduce groundwater concentrations. The alternative that involves pumping and air stripping would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS003. Active Pumping with GAC only partially addresses COCs identified for SS003. Although Natural Attenuation is effective in reducing contaminant concentrations over time, this remedial alternative is not effective in reducing the mobility of the contaminants.

ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area, but would not directly affect COC TMV. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.4.3 ERP Site SS008 – Surface Soil PHCs

Four remedial alternatives considered for PHCs in surface soil at SS008 are considered effective in reducing COC TMV: Natural Attenuation, Chemical Oxidation, Bioremediation (in-situ landfarming), and Off-site Disposal through Thermal Desorption.

ICs, No Action, Soil Cover, and Off-site Disposal through Landfilling alternatives are all ineffective in reducing COC TMV. Natural processes would attenuate COCs over time, but the rate and extent of that attenuation would not be known under the No Action and ICs alternatives due to the absence of monitoring.

2.10.4.4 ERP Site SS008 – CERCLA Hazardous Substances in Soil

Off-site Disposal through Landfilling and Soil Cover will not effectively reduce the TMV of PCB- and PCE-contaminated soil at SS008. ICs and the No Action alternative are both ineffective in reducing TMV. Natural processes would attenuate PCBs and PCE very slowly.

2.10.4.5 ERP Site SS008 – Groundwater

Four remedial alternatives considered for groundwater at SS008 reduce or eliminate COC TMV: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. Natural Attenuation can take years to reduce groundwater concentrations. The alternative that involves pumping and air stripping would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS008. Active Pumping with GAC and Natural Attenuation are only effective on the volatile COPCs identified for SS008.

ICs will serve to reduce human exposure to groundwater by preventing future development of potable wells in the area, but would not directly affect COC TMV. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.4.6 ERP Site SS011 – Surface Soil

Four remedial alternatives considered for surface soil at SS011 are considered effective in reducing COC TMV: Natural Attenuation, Chemical Oxidation, Bioremediation (biopiles), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling.

ICs,No Action, and Off-site Disposal through Landfilling alternatives are all ineffective in reducing TMV. Natural processes would attenuate COCs over time, but the rate and extent of that attenuation would not be known under the No Action and ICs alternatives due to the absence of monitoring.

2.10.4.7 ERP Site LF004

None of the alternatives considered for soil at LF004 are considered effective in reducing COC TMV through treatment.

2.10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

2.10.5.1 ERP Site SS003 – Surface Soil

Two remedial alternatives, Soil Cover and Chemical Oxidation, are effective in reducing or eliminating COC concentrations in the short-term. Although Off-site Disposal through Thermal Desorption and Off-site Disposal through Landfilling are effective in reducing contaminant concentrations in the short-term, there is potential of worker exposure to the contaminant during excavation and transport. Natural Attenuation and Bioremediation (in-situ landfarming) are projected to take years to significantly attenuate COC concentrations and, therefore, are not considered effective in the short-term.

ICs will serve to reduce future human exposure to surface soil in the short-term, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known and is not considered effective.

2.10.5.2 ERP Site SS003 – Groundwater

Four remedial alternatives considered for groundwater at SS003 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. Natural Attenuation can take years to reduce groundwater concentrations. Enhanced Bioremediation and both alternatives that involve pumping may also require several years to reduce COC concentrations. Further, the air stripping alternative would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS003. Therefore, all four alternatives are not considered effective in the short-term

ICs will serve to reduce human exposure to groundwater in the short-term by preventing future development of potable wells in the area. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known, and is not considered effective.

2.10.5.3 ERP Site SS008 – Surface Soil PHCs

Three remedial alternatives considered for PHCs in surface soil at SS008 are considered effective in reducing or eliminating COC concentrations in the short-term: Chemical Oxidation, Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling. Installing a Soil Cover will effectively prevent exposure to surface soil. Natural Attenuation and Bioremediation (in-situ landfilling) are projected to take years to significantly attenuate COC concentrations. Off-site Disposal through Thermal Desorption and Off-site Disposal through Landfilling have potential for complications associated with handling contaminated soil during transport.

ICs will serve to reduce future human exposure to surface soil in the short-term, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known and is not considered effective.

2.10.5.4 ERP Site SS008 – CERCLA Hazardous Substances in Soil

Off-site Disposal through Landfilling will effectively remove PCB and PCE-contaminated soil in the short-term, but involves potential risks to site workers due to exposure to contaminated soil during transportation. The Soil Cover alternative will effectively prevent exposure to contaminated soil in the short-term. ICs will reduce potential human exposure to PCBs and PCE in the short-term, but would be less effective in preventing ecological receptor exposure. The No Action alternative would have no short-term effect on PCBs and PCE in soil.

2.10.5.5 ERP Site SS008 – Groundwater

Four remedial alternatives considered for groundwater at SS008 reduce or eliminate COC concentrations: Natural Attenuation, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration. Natural attenuation can take years to reduce groundwater concentrations. Enhanced Bioremediation and both alternatives that involve pumping may also require several years to reduce COC concentrations. Further, the air stripping alternative would only affect volatile compounds and, thus, is only partially effective on the COCs identified for SS008.

ICs will serve to reduce human exposure to groundwater in the short-term by preventing future development of potable wells in the area. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known and is not considered effective.

2.10.5.6 ERP Site SS011 – Surface Soil

Five remedial alternatives considered for surface soil at SS011 are considered effective in reducing or eliminating COC concentrations in the short-term: Natural Attenuation, Chemical Oxidation, Bioremediation (biopiles), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling. Natural Attenuation and Bioremediation (biopiles) however, are projected to take years to significantly attenuate COC concentrations. Off-site Disposal through Thermal Desorption and Off-site Disposal through Landfilling have potential for complications associated with handling contaminated soil during transport.

ICs will serve to reduce future human exposure to surface soil in the short-term, but would be less effective in preventing ecological receptor exposure. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known and is not considered effective.

2.10.5.7 ERP Site LF004

One remedial alternative considered for soil at LF004 is considered effective in reducing or eliminating COC concentrations in the short-term: Long-Term Monitoring with ICs. Two other alternatives, ICs and Removal are considered only somewhat effective in reducing or eliminating COC concentrations in the short-term. Under the No Action alternative, natural processes would attenuate COCs, but the rate and extent of that attenuation would not be known.

2.10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

2.10.6.1 ERP Site SS003 – Surface Soil

Implementability is very much affected by the remote location of Tatalina LRRS. The No Action alternative and ICs require little or no site work and are, therefore, the easiest to implement. Natural Attenuation does require site work, but does not involve mobilizing heavy equipment to the site. The other alternatives – Soil Cover, Chemical Oxidation, Bioremediation (in-situ landfarming), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling – all require mobilizing heavy equipment to and from the site and require larger field crews to execute. There would be more difficult (but not impossible) constraints associated with mobilizing heavy equipment and extra field personnel.

2.10.6.2 ERP Site SS003 – Groundwater

All the remedial alternatives are technically and administratively feasible to implement at SS003. However, the alternatives that involve active treatment (Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration) require mobilizing equipment and several personnel to the site to execute. There is a greater complexity caused by designing and installing active systems at a remote location. Natural Attenuation requires that a small sampling crew with minimal equipment mobilize to the site periodically to monitor groundwater.

2.10.6.3 ERP Site SS008 – Surface Soil PHCs

Implementability is very much affected by the remote location of Tatalina LRRS. The No Action alternative and ICs require little or no site work and are, therefore, the easiest to implement. Natural Attenuation does require site work, but does not involve mobilizing heavy equipment to the site. The other alternatives – Soil Cover, Bioremediation (in-situ landfarming), Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling – all require mobilizing heavy equipment to and from the site, as well as larger field crews to execute. There would be more difficult (but not impossible) constraints associated with mobilizing heavy equipment and extra field personnel.

2.10.6.4 ERP Site SS008 – CERCLA Hazardous Substances in Soil

Implementability is very much affected by the remote location of Tatalina LRRS. The No Action alternative and ICs require little or no site work and are, therefore, the easiest to implement. Soil Cover and Off-site Disposal through Landfilling require mobilizing heavy equipment to and from the site. The small volume of PCB- and PCE-contaminated soil would require minimal equipment to execute both the disposal and soil cover alternatives. However, the disposal alternative requires off-site transportation of the contaminated soil.

2.10.6.5 ERP Site SS008 – Groundwater

All remedial alternatives defined for groundwater at SS008 are technically and administratively feasible to implement at the site. However, the alternatives that involve active treatment (Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC

Filtration) require mobilizing equipment and several personnel to the site to execute. There is a greater complexity caused by designing and installing active systems at a remote location. Natural Attenuation requires that small sampling crew with minimal equipment mobilize to the site periodically to monitor groundwater and soil.

2.10.6.6 ERP Site SS011 – Surface Soil

Implementability is very much affected by the remote location of Tatalina LRRS. The No Action alternative and ICs require little or no site work and are, therefore, the easiest to implement. Natural Attenuation does require site work, but does not involve mobilizing heavy equipment to the site. The other alternatives – Bioremediation (biopiles), Chemical Oxidation, Off-site Disposal through Thermal Desorption, and Off-site Disposal through Landfilling – all require mobilizing heavy equipment to and from SS011, as well as larger field crews to execute. There would be more difficult (but not impossible) constraints associated with mobilizing heavy equipment and extra field personnel.

2.10.6.7 ERP Site LF004

Implementability is very much affected by the remote location of Tatalina LRRS. The No Action alternative, ICs, and Long-term Monitoring with ICs require little or no site work and are, therefore, the easiest to implement. The other alternative, Off-site Disposal through Landfilling, requires heavy equipment to and from LF004, as well as larger field crews to execute. There would be more difficult (but not impossible) constraints associated with mobilizing heavy equipment and extra field personnel.

2.10.7 Cost

Cost summaries for remedial alternatives at SS003, SS008, SS011, and LF004 are provided in **Tables 2-14**, **2-15**, **2-16**, and **2-17**, respectively.

2.10.8 State Acceptance

The State has expressed its support for the selected remedies of: Off-site disposal of CERCLA hazardous wastes from SS008 and SS011; Bioremediation of PHCs in the surface soil (through in-situ landfarming) at SS003 and SS008; ICs with Long-term Monitoring at SS003, SS008, and LF004; and ICs at SS011. The State did not provide comments regarding the other Alternatives.

2.10.9 Community Acceptance

No comments were received during the public comment period. However, public input for similar Air Force installations has emphasized that contaminated soil should be disposed of off-site from the Tatalina LRRS property. Off-site disposal of soil contaminated with CERCLA wastes from SS008 and SS011 is an element of the selected remedy.

Table 2-14 Matrix of Cost for SS003

Media	Alternative Description	Capital Cost	Annual O&M Cost	Present Worth Cost
Surface Soil	No Action	$0	$0	$0
	Institutional Controls	$5K	$5K	$15K
	Soil Cover	$1,489K	$27K	$1,539K
	Natural Attenuation	$0	$76K[1]	$878K[1]
	Chemical Oxidation	$720K	$0	$720K
	Off-site Disposal through Thermal Desorption	$3,592	$0	$3,592
	Off-site Disposal through Landfilling	$2,924	$0	$2,924
	Bioremediation (in-situ landfarming)	$525K	$0	$525K
Groundwater	No Action	$0	$0	$0
	Institutional Controls with LTM	$37K	$37K	$106K
	Natural Attenuation	$0	$76K[1]	$878K[1]
	Enhanced Bioremediation	$469K	$50[2]	$694K[2]
	Active Pumping with Air Stripping	$685K	$30K	$809K
	Active Pumping with GAC Filtration	$514K	$43K	$691K

Key:
1 – Cost reflects combined approach for soil and groundwater.
2 – Cost has been updated from the Feasibility Study to include an annual O&M cost.
GAC – granular activated carbon
K – thousand
LTM – long-term monitoring
O&M – operation and maintenance

Table 2-15 Matrix of Cost for SS008

Media	Alternative Description	Capital Cost	Annual O&M Cost	Present Worth Cost
Surface Soil PHCs	No Action	$0	$0	$0
	Institutional Controls	$15K	$15K	$43K
	Soil Cover	$1,230K	$22K	$1,270K
	Natural Attenuation	$0	$74K[1]	$852K[1]
	Chemical Oxidation	$685K	$0	$685K
	Off-site Disposal through Thermal Desorption	$3,070K	$0	$3,070K
	Off-site Disposal through Landfilling	$2,598K	$0	$2,598K
	Bioremediation (in-situ landfarming)	$540K	$0	$540K
Soil PCBs/PCE	No Action	$0	$0	$0
	Institutional Controls	$5K	$0[2]	$5K
	Soil Cover	$81K	$5K	$90K
	Off-site Disposal through Landfilling	$250K	$0	$250K
Groundwater	No Action	$0	$0	$0
	Institutional Controls with LTM	$138K	$41K	$214K
	Natural Attenuation	$0	$74K[1]	$852K[1]
	Enhanced Bioremediation	$301K	$40K[3]	$466K[3]
	Active Pumping with Air Stripping	$898K	$118K	$1,383K
	Active Pumping with GAC Filtration	$491K	$228K	$678K

Key:
1 – Cost reflects combined approach for soil and groundwater.
2 – No O&M costs considered for Institutional Controls because they would be included with the O&M for PHCs.
3 – Cost has been updated from the Feasibility Study to include an annual O&M cost.
GAC – granular activated carbon
K – thousand
LTM – long-term monitoring
O&M – operation and maintenance
PCB – polychlorinated biphenyl
PCE – tetrochloroethene
PHC – petroleum hydrocarbon

Table 2-16 Matrix of Cost for SS011

Media	Alternative Description	Capital Cost	Annual O&M Cost	Present Worth Cost
Surface Soil	No Action	$0	$0	$0
	Institutional Controls	$5K	$5K	$15K
	Natural Attenuation	$0	$72K	$833K
	Chemical Oxidation	$178K	$0	$178K[1]
	Off-site Disposal through Thermal Desorption	$629K	$0	$629K
	Off-site Disposal through Landfilling	$560K	$0	$560K
	Bioremediation (biopile)	$167K	$65K	$287K

Key:
1 – Cost reflects a 1-year treatment period.
K – thousand
O&M – operation and maintenance

Table 2-17 Matrix of Cost for LF004

Media	Alternative Description	Capital Cost	Annual O&M Cost	Present Worth Cost
Soil and Groundwater	No Action	$0	$0	$0
	Institutional Controls	$20K	$20K	$57K
	Institutional Controls with Long-term Monitoring	$113K	$30K	$168K
	Removal	$50M	$0	$50M

Key:
K – thousand
M – million
O&M – operation and maintenance

2.11 PRINCIPAL THREAT WASTES

The NCP expects that treatment that reduces the TMV of the principal threat wastes will be used to the extent practicable. The principal threat concept refers to the source materials at a CERCLA site considered to be highly toxic or highly mobile that generally cannot be reliably controlled in place or present a significant risk to human health or the environment should exposure occur. A source material is material that contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or that acts as a source for direct exposure. This section lists the principal threat waste at SS008 and discusses how each remedial alternative would address it.

One principal threat waste at SS008 is the LNAPL present in BH37/MW. During the last sampling event in 2004, the LNAPL was approximately 0.4 inches thick. The presence of contamination will be documented during the remedial design and implementation phase through characterization of the product and product skimming. After additional information is collected,

a determination will be made about the migration of contamination and an appropriate remedial action will be completed with the approval of ADEC, if necessary.

The second principal threat waste at SS008 is the PCB contamination at BH-21 and BH-8. The selected remedy will remove and dispose of the soil at a permitted, off-site facility. Although the TMV will not be reduced, PCB contamination at SS008 will be removed from the site.

2.12 SELECTED REMEDIES

The primary indicators of remedial action performance will be satisfying the RAOs for ERP Sites SS003, SS008, SS011, and LF004 and protecting human health and the environment. Performance measures are defined herein as the RAOs (see Section 2.8), plus the required actions to achieve the objectives, as defined in this section. It is anticipated that successful implementation, operation, maintenance, and completion of the performance measures will achieve a protective and legally compliant remedy for SS003, SS008, SS011, and LF004. These remedial actions were selected based on the nine criteria for all remedies at SS003, SS008, SS001, and LF004, including:

- The remedies for SS003 include Bioremediation (through in-situ landfarming) of surface soil, long-term monitoring of groundwater, and ICs for all media. These remedial actions were selected based upon their ability to protect human health and the environment and compliance with applicable requirements. These remedies provide the best balance among the balancing criteria and appear consistent with comments received from the public and ADEC. The remedies are easily implemented, are cost effective, and are both a short and long-term solution for contamination at the site.
- The remedies for SS008 include: Excavation of PCB/PCE-contaminated soil with Off-site Disposal; Bioremediation (through in-situ landfarming) of PHC-contaminated surface soil, long-term monitoring of groundwater, and ICs for all media. The presence of LNAPL contamination in BH37/MW will be documented during the remedial design and implementation phase through characterization of the product and product skimming. After additional information is collected, a determination will be made about the migration of contamination and an appropriate remedial action will be completed with the approval of ADEC, if necessary. These remedial actions were selected based upon their ability to protect human health and the environment and compliance with applicable requirements and ARARs These remedies provide the best balance among the balancing criteria and appear consistent with comments received from the public and ADEC. The remedies are easily implemented, are cost effective, and are both a short and long-term solution for contamination at the site.
- The remedial action for SS011 includes Excavation with Off-site Disposal and ICs for surface soil. These remedial actions were selected based upon their ability to protect human health and the environment and compliance with applicable requirements and ARARs. These remedies provide the best balance among the balancing criteria and appear consistent with comments received from the public and ADEC. The remedies are easily implemented, are cost effective, and are both a short and long-term solution for contamination at the site.

- The remedial action for LF004 includes Long-term Monitoring of groundwater and ICs. These remedial actions were selected based upon their ability to protect human health and the environment and compliance with applicable requirements. These remedies provide the best balance among the balancing criteria and appear consistent with comments received from the public and ADEC. The remedies are easily implemented, are cost effective, and are both a short and long-term solution for contamination at the site.

Remedy selections are based on the detailed evaluation of remedial alternatives presented in the FS (USAF, 2009b) and Proposed Plan (USAF, 2012). It is expected that these remedies will remain in effect and be protective of human health and the environment until such time as the concentrations of COCs decrease to, or below, applicable cleanup levels. ICs will remain in effect for as long as residual contaminants at the site preclude unrestricted use and unlimited exposure.

The Air Force is responsible for implementing, maintaining, and monitoring the remedial actions identified herein for the duration of the remedies selected in this ROD. The Air Force will exercise this responsibility in accordance with CERCLA and the NCP.

2.12.1 Summary of the Rationale for the Selected Remedy

The Air Force and ADEC believe that the selected remedies meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The remedies are expected to satisfy the following selection criteria as defined by CERCLA § 121(b):

- Threshold criteria
  - Protection of Human Health and the Environment
  - Compliance with ARARs
- Balancing criteria
  - Long-term Effectiveness and Permanence
  - TMV Reduction through Treatment
  - Short-term Effectiveness
  - Implementability
  - Cost
- Modifying criteria
  - State Agency Acceptance
  - Community Acceptance

A comparative analysis among alternatives for ERP Sites SS003, SS008, SS011, and LF004 found the alternatives described in Section 2.12 to be the best options for addressing any contamination present, based on the comparison of each alternative as described in Section 2.10. These remedies all meet the baseline protectiveness required under CERCLA and the State of Alaska, and have obtained both state and community acceptance.

2.12.2 Description of the Selected Remedies

Bioremediation (through in-situ landfarming) at SS003 and SS008 will remediate the PHCs in the surface soil. Contaminated soil will be treated until remaining PHCs are below the site-specific clean-up levels. This will include stimulation of aerobic microbial activity through aeration and/or application of minerals, nutrients, and moisture. This will result in a reduction of contaminant concentrations through volatilization and enhanced microbial metabolization of PHCs adsorbed to soil.

Long-term monitoring for SS003, SS008, and LF004 groundwater would be utilized to track both CERCLA and non-CERCLA contaminant concentrations over time.

At LF004, biennial cover evaluations will be completed, along with a 5-year inspection for 20 years. Long-term monitoring will be conducted for groundwater every 5 years until contaminants are below ADEC Table C cleanup levels for two consecutive sampling events to ensure no migration of contaminants from the landfill. A 20-year timeframe was used in the FS for the detailed analysis of total costs and is not necessarily the amount of time estimated to achieve clean-up levels. At least two additional monitoring wells will be installed to triangulate groundwater flow and verify no COCs are present in the groundwater.

Excavation with off-site disposal of CERCLA hazardous material at SS008 will remove the PCB and PCE contamination from the surface and subsurface soil. PCB-contaminated soil will be excavated until remaining concentrations are below the cleanup level of 1 mg/Kg. The PCE-contaminated soil will be excavated until remaining concentrations are below the cleanup level of 0.024 mg/Kg. The amount of soil contaminated with PCBs and PCE is estimated at 25 cubic yards, although this amount may vary. The excavated material would be placed into drums or supersacks for transport off-site. Removal of the contaminated soil would be confirmed by post-excavation sampling of the bottom and sidewalls of the excavation. Clean fill (soil) from a local source would be used to backfill the excavated area.

In addition, at SS008, a detailed delineation will be done for the occurrence of free product in Monitoring Well BH37/MW. A new monitoring well will be installed in the vicinity of the PCE contamination in the southwest area of the site to determine potential groundwater impacts from PCE. Due to the uncertainty that free product will remain present in Monitoring Well BH37/MW and the potential impact to groundwater from PCE, a remedy cannot be selected at this time. However, after additional information is collected, a determination will be made about the migration of contamination and an appropriate remedial action will be completed with the approval of ADEC, if necessary. The actual technologies and sequence of technologies used for the treatment system will be determined during the remedial design. Final selection of these technologies will be based on additional site information to be collected during the remedial design. Based on this additional information and sound engineering practice, a treatment system may be designed to attain cleanup levels, if necessary.

Excavation with off-site disposal of CERCLA hazardous material (to the extent practicable) from the surface soil at SS011 will reduce the risks to human and ecological receptors. Due to the steep terrain, shallow bedrock, and soil type consisting of large cobbles, it may not be feasible to

remove all areas of contamination from this site. The excavated material would be placed into drums or supersacks for transport off-site. Removal of the contaminated soil would be confirmed by post-excavation sampling of the bottom and sidewalls of the excavation. The exposed debris will also be removed for off-site disposal. Solid waste will be disposed in a permitted landfill at Tatalina LRRS, while contaminated waste will be disposed off-site from Tatalina LRRS.

The land at these sites is designated as industrial use only currently and in the future in the Base Master Plan. However, to assess the need for ICs, contamination present at ech site was assessed for unlimited use and unrestricted exposure, in particular recreational and/or residential use. Groundwater is not safe for use as drinking, because it is contaminated above MCLs. Accordingly, the site must impose ICs to ensure the groundwater is not used for potable purposes until it is remediated to MCL levels. The objectives of ICs are to: prevent access or use of groundwater until cleanup levels are met; maintain the integrity of any current or future remedial or monitoring system such as monitoring wells; prohibit the development and use of property for residential housing, schools, child care facilities, or playgrounds; prevent the use of contaminated soil for restricted uses in the event of excavation; and implement a soils management plan.

The ICs at SS003, SS008, SS011, and LF004 will reduce human or environmental exposure to contamination, and prevent activities that may result in increased exposure or spread the extent of contamination. The principal threat waste at SS008 is soil contaminated with PCB and PCE.

The Air Force will implement, monitor, maintain, and enforce the ICs identified below in accordance with State of Alaska 18 Alaska Administrative Code (AAC) 75.375 Institutional Controls. The 611th Civil Engineering Squadron will be the point of contact for ICs. The major components of the selected response action will be implemented to restrict current and future access or exposure to soil and groundwater at these four ERP Sites. The following proposed ICs will be implemented:

- **Resource Uses, Risk Exposure Assumptions, and Risks Necessitating the ICs.** The state has designated all groundwater of the state as potential drinking water. Tatalina LRRS currently does not use this aquifer as a potable drinking water source and does not plan on doing so in the future. However, to assess the need to ICs, contamination present in the plume was assessed for risk under a potable use scenario. Groundwater is not safe for use as drinking water, because it is contaminated above MCLs. Accordingly, the Base must impose ICs to ensure the groundwater is not used for potable purposes until it is remediated to MCL levels. The land use at these sites is designated as industrial use only currently and in the future in the Base Master Plan. However, to assess the need for ICs, contamination present at each site was assessed for unlimited use and unrestricted exposure, in particular recreational and/or residential use. Residual soil contamination is not safe for recreational and/or residential use. ICs are, therefore, necessary to preclude such uses to control the disposition and use of any soil excavated from the sites.
- **Performance Objectives and Duration.** ICs will be put in place in order to: prevent access or use of the groundwater until cleanup levels are met; maintain the integrity of any current or future remedial or monitoring system, such as monitoring wells; prohibit the development and use of property for residential housing, elementary and secondary

schools, or child care facilities and playgrounds; prevent the use of contaminated soil for restricted uses in the event of excavation and implement a soils management plan; and maintain the landfill cover at LF004 in order to prevent direct exposure and water infiltration. The ICs will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unlimited use and unrestricted exposure per ADEC concurrence.

- **Description of ICs and Performance Responsibilities.** The specific mechanism for achieving the performance objectives are:
  a) The Base well permitting system will prevent any use of groundwater for drinking water.
  b) The Base construction review process will prevent damage to existing monitoring wells.
  c) All ROD use limitations and exposure restrictions will be entered in the Base Master Plan and the Geographical Information System.
  d) The Base construction review process will be used to avoid ground-disturbing construction activities and to ensure safe soil management procedures in areas with residual contamination.
  e) The Base digging permit system will be used to avoid activities that could breach the landfill cover.
  f) The Base Environmental Impact Analysis Process will be used to assess the potential environmental impact of any action proposed at the site.

  These mechanisms will be implemented and overseen by the 611th Civil Engineer Squadron. The Air Force is responsible for implementing, maintaining, monitoring, reporting and enforcing ICs. The Air Force is obligated to inform, monitor, enforce and bind, where appropriate, authorized lessees, tenants, contractors and other authorized occupants of the site of ICs impacting the site.

- **Location and Notice of Environmental Contamination.** The Tatalina LRRS comprehensive map and Base Master Plan will be updated to show the boundaries of each site to restrict excavation of soil, as well as to prevent access to groundwater. As part of the update to the Base Master Plan, the Air Force will produce maps showing locations of the residual contamination, and will provide these maps to ADEC. The Base Master Plan will contain a map indicating site location, with restrictions on any invasive activities that could potentially result in exposure of contaminants. The ICs will be documented in the Air Force Real Property Records, Tatalina LRRS General Plan, and 611th IRP Records. This will include: information about current land uses and allowed uses (prohibiting future residential land use), geographic boundaries of the ICs, an inspection of the site and submittal of performance reports. A Notice of Environmental Contamination will be placed in the Alaska Department of Natural Resources' land records.

- **Notification of Transfers and Corrective Measures.** Timely notification to ADEC of planned transfers, to include federal-to-federal transfers, of property subject to ICs. The Air Force must provide notice to ADEC at least six (6) months prior to any transfer or sale of property containing ICs so that ADEC can be involved in discussions to ensure

that appropriate provisions are included in the transfer or conveyance documents to maintain effective ICs. If it is not possible for the facility to notify ADEC at least 6 months prior to any transfer or sale, then the facility will notify ADEC as soon as possible but no later than 60 days prior, to the transfer or sale of any property subject to ICs. The Air Force agrees to provide ADEC with such notice, within the same time frames, for federal-to-federal transfer of property accountability. The Air Force will provide either access to or a copy of the executed deed or transfer assembly to ADEC.

The Air Force will also notify ADEC of any violation of the ICs or any other activity that is inconsistent with the ICs or IC objectives, as well as any obstacles to correcting the same. The Air Force will notify ADEC as soon as practicable, but no longer than 10 days after discovery, of any activity that violates or is inconsistent with the IC objectives or use restrictions, or any other action that may interfere with the effectiveness of the ICs. The Air Force will take prompt measures to correct the violation or deficiency and prevent its recurrence. In this notification, the Air Force will identify any corrective measures it has taken or any corrective measures it plans to take and the estimated time frame for completing them. For corrective measures taken after the notification, the Air Force will notify ADEC when the measures are complete.

- **Monitoring, Reporting, and Concurrence.** The Air Force will follow the 611th Land Use Control Management Plan to receive ADEC approval for site activities. The Air Force will also include the IC provisions contained in this ROD into the 611th Land Use Control Management Plan. The Air Force will monitor and inspect all site areas subject to ICs and submit a performance report to ADEC every year, for the first 5 years after the date of the signed Decision Document, followed by a 5-year review (or a summary report for the previous 5 years for the non-CERCLA sites). At that time, the frequency of inspections and reports may be reduced. The Air Force will also submit a long-term monitoring sampling plan and subsequent sampling reports to ADEC for approval prior to removal of ICs. The Air Force will not modify or terminate ICs or modify land uses that may impact the effectiveness of the ICs or take any anticipated action that may disrupt the effectiveness of the ICs, or any action that may alter or negate the need for ICs, without seeking and obtaining approval and/or review and comment from ADEC 45 days prior to the change of any required ROD modification.

The ICs established in accordance with the State of Alaska regulations will remain in effect until the COCs are below applicable 18 AAC 75 cleanup levels, at which point the ICs can be eliminated. Five-year reviews will also be conducted as long as hazardous substances are present onsite in concentrations exceeding cleanup levels.

It is important to note that the remedy may change somewhat as a result of the remedial design and construction processes. Changes, if they occur, to the remedy as described in this ROD will be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences (ESD), or ROD amendment. Only minor changes may be made without additional public notice and/or involvement.

2.12.3 Summary of Estimated Remedy Costs

A summary of the estimated remedy costs for SS003, SS008, SS011, and LF004 is provided in **Table 2-18**.

The information provided in Table 2-18 is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form an ESD or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. Costs for SS003, SS008, and SS011 were provided in the FS (USAF, 2009b). Costs for LF004 were provided in the Proposed Plan (USAF, 2012).

Table 2-18 Summary of Estimated Remedy Costs

Site	Media	Selected Remedy	Capital Cost	Annual O&M Cost	Present Worth Cost
SS003	Surface Soil	Bioremediation	$525K	$0	$525K
	Soil	ICs	$5K	$5K	$15K
	Groundwater	ICs with LTM	$37K	$37K	$106K
SS008	Soil – PCB/PCE	Excavation	$250K	$0	$250K
	Surface Soil	Bioremediation	$540K	$0	$540K
	Soil	ICs	$15K	$15K	$43K
	Groundwater	ICs with LTM	$138K	$41K	$214K
SS011	Surface Soil	Excavation	$560K	$0	$560K
LF004	Soil and Groundwater	ICs with LTM	$113K	$30K	$168K
Total					**$2.5 M**

Key:
IC – institutional control
K – thousand
LTM – long-term monitoring
M – million
O&M – operation and maintenance
PCB – polychlorinated biphenyl
PCE – tetrochloroethene

2.12.4 Expected Outcomes of Selected Remedies

Upon completion of the selected remedies, Tatalina LRRS ERP Sites SS003, SS008, SS011, and LF004 will be in compliance with CERCLA and the State of Alaska environmental statutes. No known contamination above ADEC Method Two soil cleanup levels identified in 18 AAC 75, Table B1, for under 40-inch zone, and ADEC Table C groundwater cleanup levels will remain at LF004; however, it is a former landfill and an operating landfill overlays the majority of the site. Contamination above ADEC Method Two soil and ADEC Table C groundwater cleanup levels will remain onsite at SS003, SS008, and SS011. Refer to Tables 2-3, 2-4, and 2-5 for COCs and concentrations. However, the selected remedies, which include ICs, will limit human exposure to

contaminants at these sites and promote the safety of human health and the environment. The ICs that are a component of the remedies for these sites will be effective immediately upon implementation of the ICs, which will require surveying and recording as a legal document. The survey will document the location of the ICs and will be recorded.

Tables 2-19, **2-20**, **2-21, and 2-22** summarize the cleanup levels, the basis for the cleanup level, and the risk at the cleanup level.

Table 2-19 SS003 – Cleanup Levels for Chemicals of Concern

Chemical of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level
Surface Soil			
Naphthalene	81 mg/Kg	Risk Assessment	Cancer risk = $1x10^{-5}$
1,2,4-Trimethylbenzene	116 mg/Kg	Risk Assessment	Non-cancer HQ = 1
1,3,5-Trimethylbenzene	82 mg/Kg	Risk Assessment	Non-cancer HQ = 1
Total Xylenes	2,029 mg/Kg	Risk Assessment	Ecological HQ = 1
DRO	1,000 mg/Kg	ADEC/USAF Agreement	Not Calculated
GRO	347 mg/Kg	Risk Assessment	Ecological HQ = 1
RRO	11,000 mg/Kg	ADEC Method Two	Cancer risk = $1x10^{-5}$
Groundwater			
Benzene	0.005 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
Ethylbenzene	0.7 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
3,3'-Dichlorobenzidine	0.0019 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
bis(2-chloroethyl) Ether	0.00077 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
Hexachlorobutadiene	0.0073 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
DRO	1.5 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
GRO	2.2 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
RRO	1.1 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
Sediment			
Bis(2-ethylhexyl)phthalate	0.19 mg/Kg	Risk Assessment	Ecological HQ = 1

Key:
ADEC – Alaska Department of Environmental Conservation
DRO – diesel range organics
GRO – gasoline range organics
HQ – hazard quotient
mg/Kg – milligrams per kilogram
mg/L – milligrams per liter
RRO – residual range organics
USAF – U.S. Air Force

Table 2-20 SS008 – Cleanup Levels for Chemicals of Concern

Chemical of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level
Surface Soil			
PCB (Arochlor 1260)	1 mg/Kg	ADEC Method Two based on federal TSCA Regulations	Cancer risk = $1x10^{-5}$
DRO	1,000 mg/Kg	ADEC/USAF Agreement	Not Calculated
GRO	323 mg/Kg	Risk Assessment	Ecological HQ = 1
RRO	11,000 mg/Kg	ADEC Method Two	Cancer risk = $1x10^{-5}$
Groundwater			
1,2-Dibromomethane	0.00005 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
2-Methylnaphthalene	0.15 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
DRO	1.5 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
Lead	0.015 mg/L	ADEC Table C	Cancer risk = $1x10^{-5}$
Sediment			
DRO	265 mg/Kg	Risk Assessment	Ecological = $1x10^{-5}$
RRO	22 mg/Kg	Risk Assessment	Ecological = $1x10^{-5}$
PCE	0.024 mg/Kg	ADEC Method Two	Cancer risk = $1x10^{-5}$

Key:
ADEC – Alaska Department of Environmental Conservation
DRO – diesel range organics
GRO – gasoline range organics
HQ – hazard quotient
mg/Kg – milligrams per kilogram
mg/L – milligrams per liter
PCB – polychlorinated biphenyls
PCE – tetrachloroethene
RRO – residual range organics
TSCA – Toxic Substances Control Act
USAF – U.S. Air Force

Table 2-21 SS011 – Cleanup Levels for Chemicals of Concern

Chemical of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level
Surface Soil			
2-Methylnaphthalene	3.356 mg/Kg	Risk Assessment	Ecological HQ = 1
Acenaphthene	9.898 mg/Kg	Risk Assessment	Ecological HQ = 1
Anthracene	6.065 mg/Kg	Risk Assessment	Ecological HQ = 1
Benzo(a)anthracene	7.241 mg/Kg	Risk Assessment	Ecological HQ = 1
Benzo(a)pyrene	2.4 mg/Kg	Risk Assessment	Cancer risk = $1x10^{-5}$
Benzo(b)fluoranthene	5.650 mg/Kg	Risk Assessment	Ecological HQ = 1
Benzo(k)fluoranthene	0.791 mg/Kg	Risk Assessment	Ecological HQ = 1
Chrysene	6.404 mg/Kg	Risk Assessment	Ecological HQ = 1
Dibenz(a,h)anthracene	2.4 mg/Kg	Risk Assessment	Cancer risk = $1x10^{-5}$
Fluoranthene	4.841 mg/Kg	Risk Assessment	Ecological HQ = 1
Fluorene	1.549 mg/Kg	Risk Assessment	Ecological HQ = 1
Indeno(1,2,3-cd)pyrene	5.142 mg/Kg	Risk Assessment	Ecological HQ = 1
Naphthalene	3.356 mg/Kg	Risk Assessment	Ecological HQ = 1
Alpha-BHC	3 mg/Kg	Risk Assessment	Cancer risk = $1x10^{-5}$
Phenanthrene	8.487 mg/Kg	Risk Assessment	Ecological HQ = 1
Pyrene	8.344 mg/Kg	Risk Assessment	Ecological HQ = 1
Endrin	0.119 mg/Kg	Risk Assessment	Ecological HQ = 1
Endrin aldehyde	0.119 mg/Kg	Risk Assessment	Ecological HQ = 1
Endrin ketone	0.119 mg/Kg	Risk Assessment	Ecological HQ = 1
DRO	1,000 mg/Kg	ADEC/USAF Agreement	Not calculated
RRO – Aromatic	11,000 mg/Kg	ADEC Method Two	Cancer risk = $1x10^{-5}$
Sediment			
RRO	36 mg/Kg	Risk Assessment	Ecological HQ = 1

Key:
ADEC – Alaska Department of Environmental Conservation
BHC – benzene hexachloride
DRO – diesel range organics
HQ = hazard quotient
mg/Kg – milligrams per kilogram
RRO – residual range organics
USAF – U.S. Air Force

Table 2-22 LF004 – Cleanup Levels for Chemicals of Concern

Chemical of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level
Surface Soil and Sediment			
4,4'-DDD	7.2 mg/Kg	Risk Assessment	Ecological HQ = 1
4,4'-DDE	5.1 mg/Kg	Risk Assessment	Ecological HQ = 1
4,4'-DDT	7.3 mg/Kg	Risk Assessment	Ecological HQ = 1

Key:
DDD – dichlorodiphenyldichloroethane
DDE– dichlorodiphenyldichloroethylene
DDT – dichlorodiphenyltrichloroethane
HQ – hazard quotient
mg/Kg – milligrams per kilogram

2.13 STATUTORY DETERMINATIONS

Under CERCLA §121 (as required by NCP §300.430(f)(5)(ii)), the lead agency must select a remedy that is protective of human health and the environment, complies with ARARs, is cost-effective, and uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, periodic 5-year reviews are required if after the remedy hazardous substances will remain in place above levels allowing for unlimited use and unrestricted exposure. CERCLA also includes: 1) a preference for remedies that employ treatment which permanently and significantly reduces the TMV of hazardous wastes as a principal element; and 2) a bias against offsite disposal of untreated wastes. The following sections discuss how each selected remedy meets these statutory requirements.

2.13.1 Protection of Human Health and the Environment

Excavation of CERCLA hazardous materials at SS008 and SS011 would serve to protect human health and the environment by reducing COC concentrations from the designated attainment areas at Tatalina LRRS and relocating to an off-site, permitted facility.

Bioremediation of soils through in-situ landfarming at SS003 and SS008 is expected to effectively protect human health and the environment by reducing COC concentrations below the site-specific clean-up levels.

ICs will reduce human and ecological exposure to groundwater at SS003, SS008, and LF004 by preventing future development of groundwater resources in the area. ICs at all sites would serve to reduce human and ecological exposure to the remaining soil contaminants.

2.13.2 Compliance with ARARs

Remedial actions must comply with both Federal and State ARARs. ARARs are legally applicable or relevant and appropriate requirements, standards, criteria, or limitations of Federal and State environmental laws and regulations. Criteria to be considered (TBCs), are non-promulgated advisories or guidance issued by federal or state government that are not legally

binding and do not have the status of potential ARARs. However, in many circumstances, TBCs are considered along with ARARs.

Table 2-23 summarizes the ARARs and TBCs for the selected remedies at ERP Sites SS003, SS008, SS0011, and LF004 and describes how the selected remedies address each one at agreed-upon points of compliance.

The selected remedies comply with the chemical-specific, location-specific, and action-specific ARARs. The implementation of each remedy is required to meet the substantive portions of these requirements at agreed-upon points of compliance and is exempt from administrative requirements such as permitting and notifications.

2.13.3 Cost Effectiveness

In the Air Force's judgment, each selected remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (40 CFR 300.430[f][1][ii][D]). This determination was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfy the threshold criteria (that is, is protective of human health and the environment and ARAR-compliant).

Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination: long-term effectiveness and permanence; reduction in TMV through treatment; and short-term effectiveness. Overall effectiveness was then compared to costs to determine cost-effectiveness. The overall effectiveness of the selected remedies for ERP Sites SS003, SS008, SS011, and LF004 were demonstrated in the comparative analysis of alternatives (Section 2.10). The estimated present worth cost of the selected remedies (in 2012 dollars) is $2.5 million.

It is important to note that more than one cleanup alternative can be cost-effective, and the Superfund program does not mandate the selection of the most cost-effective cleanup alternative. In addition, the most cost-effective remedy is not necessarily the remedy that provides the best balance of tradeoffs with respect to the remedy selection criteria, nor is it necessarily the least-costly alternative that is both protective of human health and the environment and ARAR-compliant. Rather, cost-effectiveness is concerned with the reasonableness of the relationship between the effectiveness afforded by each alternative and its costs compared to other available options.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies

The Air Force has determined that the selected remedies provide the best balance of trade-offs among the alternatives with respect to the five balancing criteria set out in NCP 300.430(f)(l)(i)(B). Although no onsite treatment is being utilized for CERCLA hazardous materials at SS008 and SS011, the selected remedy of excavation provides the most effective, long-term solution given the conditions at each site. Excavation with off-site disposal of CERCLA hazardous materials is protective of human health and the environment by

Table 2-23 Description of ARARs and TBCs

Type	Medium	Authority	Requirement	Synopsis of Requirement	Status
Chemical-Specific	Soil	State Regulatory Requirement	State of Alaska Method Two Cleanup Criteria 18 AAC 75	Provides cleanup levels for specific contaminants.	Applicable
		Federal Regulatory Requirement	TSCA 40 CFR 700 through 766	Provides federal regulations on sampling and analytical protocols and cleanup levels for PCBs.	Applicable
Location-Specific	N/A	Federal Regulatory Requirement	Migratory Bird Treaty Act of 1972 (16 USC 703-712) 50 CFR, Parts 10, 20, and 21 Bald Eagle Protection Act (16 USC 668-668d)	Requires that federal agencies examine proposed actions relative to species impacts pertaining to habitat losses or losses of individual birds. Requires protection of most species of native birds in U.S. from unregulated "take," which can include poisoning at waste sites.	Applicable
Action-Specific	N/A	Federal Regulatory Requirements	29 USC Sec 657 and 667 29 CFR 1910 29 CFR 1926 29 CFR 1925	General standards for safety in the workplace.	TBC
		State Regulatory Requirement	8 AAC 61 – Alaska Occupational Safety and Health	Protection standards for workers in hazardous waste sites and construction sites who are performing work under federal service contracts.	
Action-Specific	N/A	Federal Regulatory Requirements	40 CFR 761	EPA Spill Cleanup Policy. Storage and disposal requirements, including onsite storage limitations for PCB wastes. Notification and record keeping requirements for PCB disposal.	Applicable
		State Regulatory Requirement	ADEC (18 AAC 75)		

Table 2-23 (Cont.) Description of ARARs and TBCs

Type	Medium	Authority	Requirement	Synopsis of Requirement	Status
Action-Specific	N/A	Federal Regulatory Requirements	RCRA Subtitle D (40 CFR 257-258) RCRA Subtitle C (40 CFR 260-268) TSCA (40 CFR 761) SDWA (40 CFR 114-147)	Classification of contaminated soil as non-hazardous, PCB waste, or hazardous waste. Selection of an appropriate waste treatment and/or disposal facility.	Applicable
		State Regulatory Requirements	ADEC (18 AAC 75) 18 AAC 60		
Action-Specific	N/A	State Regulatory Requirements	ADEC (18 AAC 75.320-.380)	Applicable requirements for use with ICs, Soil Cover, Natural Attenuation, Chemical Oxidation, Off-site Disposal through Thermal Treatment, Off-site Disposal through Landfilling, Bioremediation, Enhanced Bioremediation, Pumping with Air Stripping, and Pumping with GAC Filtration.	Applicable
Action-Specific	N/A	State Regulatory Requirements	ADEC (18 AAC 70)	Applicable requirements for use with Off-site Disposal through Thermal Treatment and Off-site Disposal through Landfilling if there are waterbodies or wetlands in the area.	Applicable
Action-Specific	N/A	State Regulatory Requirements	ADEC (18 AAC 63)	Siting of Hazardous Waste Management Facilities	Applicable

Key:
AAC – Alaska Administrative Code
ADEC – Alaska Department of Environmental Conservation
ARAR – applicable or relevant and appropriate requirement
CFR – Code of Federal Regulations
GAC – Granular Activated Carbon
EPA – U.S. Environmental Protection Agency
IC – institutional controls
N/A – not applicable
PCB – polychlorinated biphenyl
RCRA – Resource Conservation and Recovery Act
SDWA – Safe Drinking Water Act
TBC – to be considered
TSCA – Toxic Substance Control Act
USC – United States Code

permanently removing contaminated soil from the site, readily implementable, and cost effective in comparison to other alternatives. Treatment is being utilized for the PHCs in the surface soil at SS003 and SS008.

2.13.5 Preference for Treatment as a Principal Element

The NCP establishes the expectation that treatment will be used to address the principal threats posed by a site wherever practicable (40 CFR 300.430[a][1][iii][A]). The selected remedy and the remedial process at each site was focused on treatment of principal site threats. The selected remedy of Bioremediation Through In-situ Landfarming for PHCs at SS003 and SS008 satisfies the statutory preference for treatment as a principal element of the remedy. The selected remedy of Excavation with Off-site Disposal for CERCLA COCs at SS008 and SS011 does not satisfy the statutory preference for treatment as a principal element of the remedy, but is preferred because of the greater constraints to implementability and high disproportionate costs associated without a significant reduction in risk.

2.13.6 Five-Year Review Requirements

Pursuant to CERCLA §121(c) and NCP §300.430(f)(5)(iii)(C), because the selected remedy, at completion, will not result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will not be required within 5 years after initiation of the remedial action to verify that the remedy is, or will be, protective of human health and the environment at ERP Site SS003.

Pursuant to Air Force and ADEC policy, because the selected remedy, which at completion will remain onsite hazardous substance levels that allow for unlimited use and unrestricted exposure, will not attain this result within 5 years of the remedy construction complete, a policy review will be required within 5 years after initiation of the remedial action to verify that the remedy is, or will be, protective of human health and the environment at ERP Sites SS008, SS011, and LF004.

The approval and signature of this ROD will signify the initiation of remedial action.

Five-Year Reviews will be conducted until concentrations of hazardous substances, pollutants, or contaminants remaining onsite are reduced to levels that allow for unlimited use and unrestricted exposure.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan was released for public comment in May 2012. It identified Alternative 3, Long-term Monitoring and ICs, as the Preferred Alternative under Alaska State Regulation. The Proposed Plan stated "No analytes included in CERCLA's definition of hazardous substances have been detected at this site; therefore, LF004 is not subject to CERCLA reporting, response, or liability requirements; and no action is proposed under CERCLA." However, further investigation into the onsite pesticides has determined that the site should be addressed under CERCLA with the same remedy as selected in the Proposed Plan.

There have been no significant changes to the proposed remedies presented in the Proposed Plan for ERP Sites SS003, SS008, and SS011.

3.0 RESPONSIVENESS SUMMARY

This section provides a summary of the public comments regarding the Proposed Plan for remedial action at ERP Sites SS003, SS008, SS011, and LF004 at Tatalina LRRS and the Air Force response to comments. At the time of the public review period, the Air Force had selected: Off-site disposal of CERCLA hazardous wastes from SS008 and SS011; Bioremediation of PHCs in the surface soil (through in-situ landfarming) at SS003 and SS008; Long-term Monitoring at SS003, SS008, and LF004; and ICs at all sites as the selected remedies for these sites.

No written comments were received during the public comment period.

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

No stakeholder comments were received by the Air Force during the public review period of the Proposed Plan.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues were identified during the public review period of the Proposed Plan.

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APPENDIX A

Notice of Availability

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FOURTH DISTRICT
} SS.

Before me, the undersigned, a notary public, this day personally appeared Bonnie Keenan, who, being first duly sworn, according to law, says that he/she is an Advertising Clerk of the Fairbanks Daily News-Miner, a newspaper (i) published in newspaper format, (ii) distributed daily more than 50 weeks per year, (iii) with a total circulation of more than 500 and more than 10% of the population of the Fourth Judicial District, (iv) holding a second class mailing permit from the United States Postal Service, (v) not published primarily to distribute advertising, and (vi) not intended for a particular professional or occupational group. The advertisement which is attached is a true copy of the advertisement published in said paper on the following day(s):

May 6, 2012

and that the rate charged thereon is not excess of the rate charged private individuals, with the usual discounts.

Bonnie Keenan

Subscribed and sworn to before me on this 8 day of May, 2012

Notary Public in and for the State Alaska.

My commission expires 10/25/2015

NOTARY PUBLIC OF ALASKA

430096
PUBLIC NOTICE
U.S. AIR FORCE
ANNOUNCES
PROPOSED PLAN
30-DAY PUBLIC
COMMENT PERIOD
–
TATALINA
LONG RANGE
RADAR SITE

The 611th Civil Engineer Squadron (611 CES) at Joint Base Elmendorf-Richardson announces the Proposed Plan and 30-day public comment period regarding proposed environmental cleanup alternatives for four Installation Restoration Program sites (SS003, SS008, SS011 & LF004) at Tatalina Long Range Radar Site (LRRS). The Tatalina LRRS is located 10 miles southeast of Takotna, AK and 14 miles west of McGrath, AK.

The proposed remedial action for the sites are: **SS003** - Bioremediation through In-situ Landfarming for surface soil, Long-term Monitoring for groundwater, and Institutional Controls (ICs); **SS008** - Excavation with Offsite Disposal of PCB/PCE-contaminated soil, Bioremediation through In-situ Landfarming for surface soil, Long-term Monitoring for groundwater, and ICs; **SS011** - Excavation with Offsite Disposal of surface soil and ICs and; **LF004** - Long-term Monitoring for groundwater and ICs.

The public is encouraged to review and comment on the Proposed Plan. Written public comments will be accepted. The public comment period begins May 7, 2012, and ends on June 6, 2012. If there is sufficient interest for a public meeting on this Proposed Plan, and a meeting is requested before the end of the comment period, an acceptable meeting date will be scheduled before June 20, 2012, and the comment period extended.

The Proposed Plan can be viewed or downloaded at http://dec.alaska.gov/spar/csp/list.htm#Interior.

The Administrative Record, a file containing all information used by the Air Force to make its decision on the selection of previous CERCLA response actions, can be viewed at *www.adminrec.com*. **DoD, PACAF, Alaska, Tatalina.**

For a copy of the Proposed Plan or additional information, or to send comments, please contact:

Mr. Tommie Baker
Community
Involvement
Coordinator
611 CES/CEAR
10471 20th Street,
Suite 340
JBER, AK
99506-2201
1-800-222-4137
1-907-552-4506
tommie.baker
@us.af.mil

Mr. Robert Johnston
Remedial Project
Manager
611 CES/CEAR
10471 20th Street,
Suite 302
JBER, AK
99506-2201
1-907-552-7193
robert.johnston.1
@elmendorf.af.mil

Publish: 05/06/12

Affidavit of Publication

United States of America • State of Alaska • Fourth Division

Before me, the undersigned, a notary public this day personally appeared Annette Shacklett who, being first duly sworn, according to law, says that he/she is publisher the of The Tundra Drums, published at in said Division Four and State of Alaska and that the advertisement, of which the annexed is a true copy, was published in said publication on

the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the _____ day of _____ 20____, and
the 14 day of May 2012.

Annette M. Shacklett,
Annette Shacklett, Publisher

Subscribed and sworn to before me

This 18th day of May 2012

/s/ Annemarie Williamson
Notary public for state of Alaska

My commission expires 9.30.13

ANNEMARIE WILLIAMSON
My Commission Expires
NOTARY PUBLIC
Sept. 30, 2013
STATE OF ALASKA

MWHG USAF INV 926

CLASSIFIED ADS & PUBLIC NOTICES

Rates: **55 cents per word, minimum $5.50 per ad.**
Deadline: **Noon, Tuesday, week prior**
advertising@TheTundraDrums.com
907-224-4888

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LOG CABIN FOR SALE IN ANIAK
800 sq ft, 1 bed, 1 bath
Current appraisal avail.
$130,000
(907) 982-4380

(4/2-?)

ANIMALS

1 male and 1 female 6-month-old English Bulldogs for free to a good home due to relocation, please contact charlesmorris1958@gmail.com if interested or for more information.

(5/14-6/11)

PUBLIC NOTICES

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES (DOT/PF)
CENTRAL REGION
INVITATION FOR BIDS

Project Bid Title: Nunapitchuk Airport Maintenance

Project Bid No.: 13-25A-1-007

Estimated Cost: Between $2,000.00 and $25,000.00

Bid Opening: 1:00 PM on May 29, 2012

Telephone: (907) 269-0767

Copies of the Contract bid documents may be obtained at the Nunapitchuk Post Office or the M&O Bethel Station Airport Manager's Office.

Additional Information is available on the web at (http://dot.alaska.gov). Under the Section called Quick Links, select the following in order Public Notices, By Dept, Transportation & Public Facilities and Procurement.

AO 12-60-030 Pub: May 14, 2012

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES (DOT/PF)
CENTRAL REGION
INVITATION FOR BIDS

Project Bid Title: Toksook Bay Airport Maintenance

Project Bid No.: 13-25A-2-013

Estimated Cost: Less than $100,000

Bid Opening: 2:00 PM on May 16, 2012

Telephone: (907) 269-0767

TTD: (907) 269-0473

Copies of the Contract bid documents may be obtained at the Toksook Bay Post Office or the M&O Bethel Station Airport Manager's Office.

Additional information is available on the web at (**www.dot.alaska.gov**). Under the Section called Quick Links, select the following in order Procurement, Construction Bidding Home, Current Bid Calendar and Central Region.

AO 12-60-022 Pub: May 14, 2012

PUBLIC NOTICES

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES (DOT/PF)
CENTRAL REGION
INVITATION FOR BIDS

Project Bid Title: Tuntutuliak Airport Maintenance ReBid

Project Bid No.: 13-25A-1-006

Estimated Cost: Between $2,000.00 and $25,000.00

Bid Opening: 1:00 PM on May 23, 2012

Telephone: (907) 269-0767

Copies of the Contract bid documents may be obtained at the Tuntutuliak Post Office or the M&O Bethel Station Airport Manager's Office.

Additional Information is available on the web at (http://dot.alaska.gov). Under the Section called Quick Links, select the following in order Public Notices, By Dept, Transportation & Public Facilities and Procurement.

AO 12-60-028 Pub: May 14, 2012

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES (DOT/PF)
CENTRAL REGION
INVITATION FOR BIDS

Project Bid Title: Tununak Airport Maintenance

Project Bid No.: 13-25A-2-014

Estimated Cost: Less than $100,000

Bid Opening: 2:00 PM on May 18, 2012

Telephone: (907) 269-0767

TTD: (907) 269-0473

Copies of the Contract bid documents may be obtained at the Tununak Post Office or the M&O Bethel Station Airport Manager's Office.

Additional information is available on the web at (**www.dot.alaska.gov**). Under the Section called Quick Links, select the following in order Procurement, Construction Bidding Home, Current Bid Calendar and Central Region.

AO 12-60-023 Pub: May 14, 2012

PUBLIC NOTICE
Notice of School Property Conveyance
By the State of Alaska, Department of Education & Early Development to the Lower Yukon School District
Alakanuk School Sites

Pursuant to AS 14.08.101(8) and AS 14.08.151(b), the Department of Education & Early Development proposes to transfer its ownership of all land and structures located within Lots 1-4, 19- 22, Block 6, and Lots 1-8, Block 3, U.S. Survey No. 4405, containing 5.52 acres in Alakanuk, Alaska, to the Lower Yukon School District.

Public comments on this proposed action must be received by 5 p.m. on June 7th, 2012 and directed to the Alaska Department of Education & Early Development, School Finance/Facilities, Attn: Jane Ann Boer, 801 W. 10th St., Suite 200, P.O. Box 110500, Juneau, AK 99811. Comments can be e-mailed to Jane.Boer@alaska.gov . For questions about this proposed action, contact Jane Boer at (907) 465-2785.

AO-520051 Pub: May 14 & 28, 2012

PUBLIC NOTICES

TerraSond, Ltd. will be conducting a hydrographic survey of the Nushagak River from Dillingham southward during the summer of 2012. The survey will be performed by the Latent Sea (27' aluminum hull) and two small jet SeaDoo boats (15 ft in length). The project will run from mid-May through mid-September. Shore stations will be installed at permitted sites. Results will be used to update NOAA nautical charts. Contact Project Manager at 907-745-7215 ext. 181 or aorthmann@terrasond.com for more information.

2012-006 Pub: May 14, 2012

PUBLIC NOTICE
U.S. AIR FORCE ANNOUNCES
PROPOSED PLAN
30-DAY PUBLIC COMMENT PERIOD
~
TATALINA LONG RANGE RADAR SITE

The 611th Civil Engineer Squadron (611 CES) at Joint Base Elmendorf-Richardson announces the Proposed Plan and 30-day public comment period regarding proposed environmental cleanup alternatives for four Installation Restoration Program sites (SS003, SS008, SS011 & LF004) at Tatalina Long Range Radar Site (LRRS). The Tatalina LRRS is located 10 miles southeast of Takotna, AK and 14 miles west of McGrath, AK.

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For a copy of the Proposed Plan or additional information, or to send comments, please contact:

Mr. Tommie Baker
Community Involvement Coordinator
611 CES/CEAR
10471 20th Street, Suite 340
JBER, AK 99506-2201
1-800-222-4137
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tommie.baker@us.af.mil

Mr. Robert Johnston
Remedial Project Manager
611 CES/CEAR
10471 20th Street, Suite 302
JBER, AK 99506-2201
1-907-552-7193
robert.johnston.1@elmendorf.af.mil

Pub: May 14, 2012

PUBLIC NOTICES

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Nuvista Light and Electric Cooperative, Inc.

Project No.14369-000

NOTICE OF PRELIMINARY PERMIT APPLICATION ACCEPTED FOR FILING AND SOLICITING COMMENTS, MOTIONS TO INTERVENE, AND COMPETING APPLICATIONS

(March 27, 2012)

On March 2, 2012, Nuvista Light and Electric Cooperative, Inc., filed an application for a preliminary permit, pursuant to section 4(f) of the Federal Power Act (FPA), proposing to study the feasibility of the Chikuminuk Lake Hydroelectric Project (Chikuminuk Project or project) to be located on the Allen River, 118 miles southeast of Bethel, Alaska, in the unincorporated Bethel and Dillingham Census Area, Alaska. The project would be partially located on federal lands managed by the U.S. Fish and Wildlife Service in the Yukon Delta National Wildlife Refuge. The sole purpose of a preliminary permit, if issued, is to grant the permit holder priority to file a license application during the permit term. A preliminary permit does not authorize the permit holder to perform any land-disturbing activities or otherwise enter upon lands or waters owned by others without the owners' express permission.

The proposed project would consist of the following: (1) an approximately 1,325-foot-long, 128-foot-high concrete-faced rockfill dam; (2) a 25-foot-diameter intake structure; (3) a 775-foot-long, 25-foot-diameter tunnel bringing flows from the intake to a gate house; (4) a gate house and gate shaft to convey flows from the tunnel to the main penstock; (5) a 120-foot-long, 9- to 13-foot-diameter main penstock, which bifercates into a 135-foot-long, 9-foot-diameter penstock leading to turbine 1 and a 115-foot-long, 9-foot-diameter penstock leading to turbine 2; (6) a 150-foot-long, 75-foot-wide powerhouse containing two vertical Francis turbine/generator units rated for 6.7 megawatts (MW) each, for a total installed capacity of 13.4 MW; (7) a 100-foot-long, 75-foot-wide tailrace returning project flows to the Allen River; (8) a 118-mile long, 138-kilovolt transmission line leading from the powerhouse to a substation in the town of Bethel; (9) project access facilities, including a float plane dock and a heliport; (10) project roads leading from the float plane dock to the dam and powerhouse; and (11) appurtenant facilities. The estimated annual generation of the Chikuminuk Project would be 88.7 gigawatt-hours.

Applicant Contact: Ms. Elaine Brown, Executive Director, Nuvista Light and Electric Cooperative, Inc., 301 Calista Court, Suite A, Anchorage, Alaska 99518; phone: (907) 868-2460.

FERC Contact: Jennifer Harper; phone: (202) 502-6136.

Deadline for filing comments, motions to intervene, competing applications (without notices of intent), or notices of intent to file competing applications: 60 days from the issuance of this notice. Competing applications and notices of intent must meet the requirements of 18 CFR 4.36. Comments, motions to intervene, notices of intent, and competing applications may be filed electronically via the Internet. See 18 CFR 385.2001(a)(1)(iii) and the instructions on the Commission's website http://www.ferc.gov/docs-filing/efiling.asp. Commenters can submit brief comments up to 6,000 characters, without prior registration, using the eComment system at http://www.ferc.gov/docs-filing/ecomment.asp. You must include your name and contact information at the end of your comments. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, (202) 502-8659. Although the Commission strongly encourages electronic filing, documents may also be paper-filed. To paper-file, mail an original and seven copies to: Kimberly D. Bose, Secretary, Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC 20426.

More information about this project, including a copy of the application, can be viewed or printed on the "eLibrary" link of Commission's website at http://www.ferc.gov/docs-filing/elibrary.asp. Enter the docket number (P-14369) in the docket number field to access the document. For assistance, contact FERC Online Support.

Kimberly D. Bose,

Secretary.

Pub: April 16-May 14, 2012

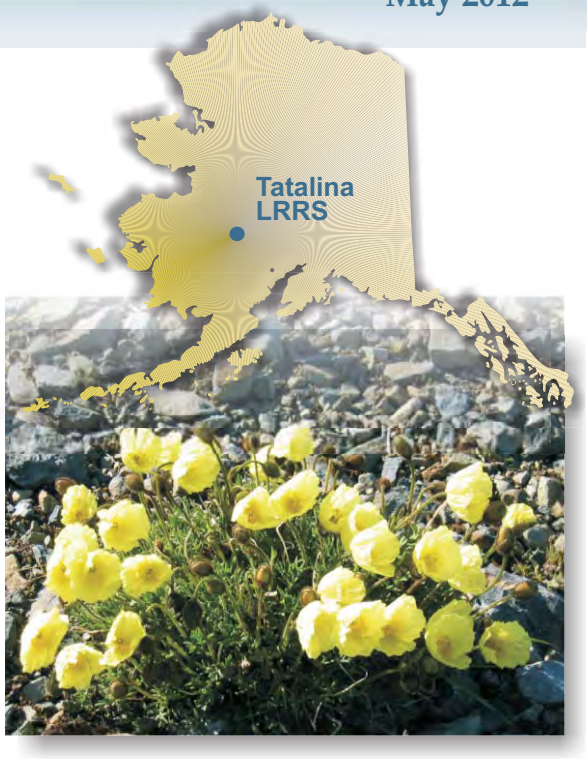
APPENDIX B

Proposed Plans

Proposed Plan for Remedial Action

Tatalina
Long Range Radar Site

Tatalina, Alaska
May 2012



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Site Characteristics	7
Summary of Site Risk	12
Summary of Alternatives	14
Evaluation of Alternatives	16
Preferred Alternative	24

Introduction

The U.S. Air Force (Air Force) requests your comments on this **Proposed Plan** for **Environmental Restoration Program (ERP)** sites at Tatalina Long Range Radar Site (LRRS), Alaska. The ERP Sites included in this Proposed Plan (Figure 1) are:

- SS003: This was the location of a Petroleum, Oil, and Lubricant (POL) Tank Farm, which had four different spills/leaks from 1970-1982.

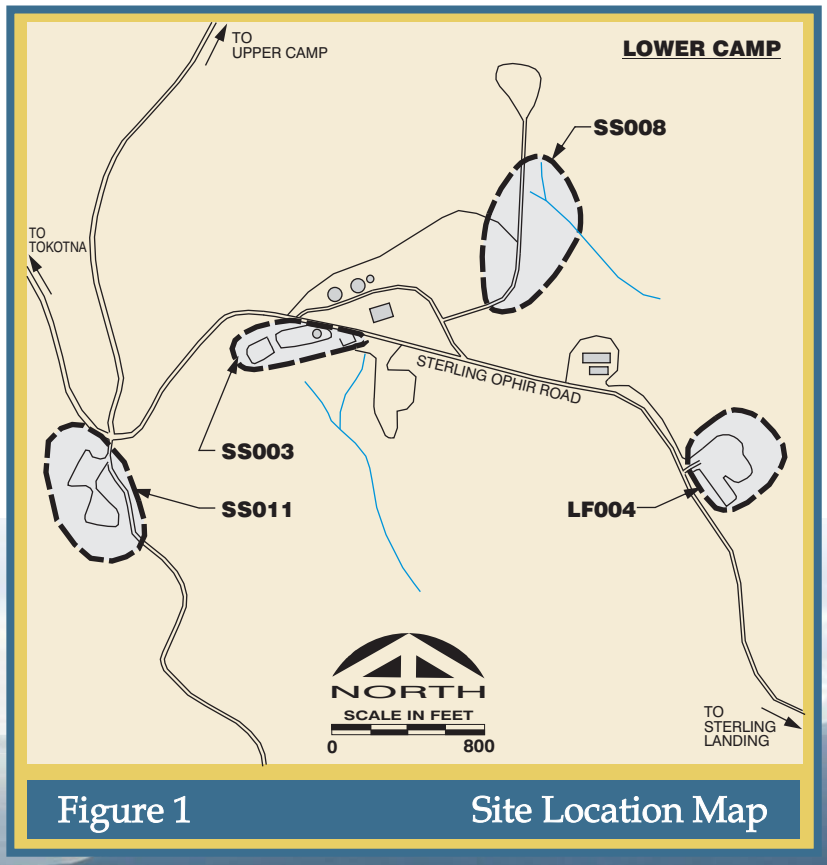


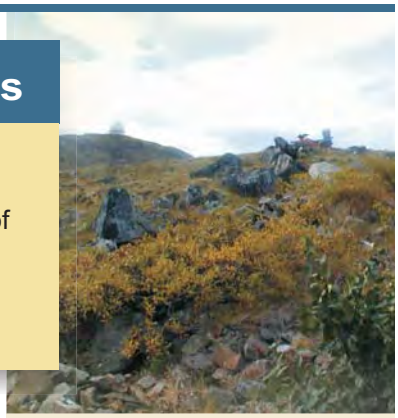
Figure 1 Site Location Map

Regulatory Basis

This Proposed Plan is issued in accordance with and satisfies the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, at 42 USC § 9601 et. seq.), as further implicated by the National Contingency Plan (NCP, at 40 CFR Part 300). The Environmental Restoration Program is the program the Air Force uses to take CERCLA response actions and satisfy its CERCLA lead agency functions as delegated by Executive Order 12580. This Proposed Plan also meets requirements of Alaska State law and regulations including, but not limited to, Title 46 of the Alaska Statutes and the regulations promulgated thereunder. This Proposed Plan is a document that the Air Force is required to issue to fulfill the requirements of CERCLA § 117(a) and NCP § 300.430 (f)(2).

Summary of Preferred Remedial Alternatives

The preferred remedial alternatives for the CERCLA sites discussed in this Proposed Plan are Offsite Disposal of PCB/PCE contaminated soil and Long-term groundwater monitoring at SS008 and Offsite Disposal of debris and contaminated soil at SS011. The preferred remedial alternatives for the non-CERCLA sites are Bioremediation of Surface Soils at SS003 and SS008, Long-term Monitoring at SS003 and LF004, and Institutional Controls (ICs) at all sites.



- SS008: This was used for storage of waste oil drums from 1950-1984.
- SS011: This was a liquid drum storage area from the 1950s.
- LF004: This was a landfill used to bury wastes from the mid-1960s to around 2000.

This Proposed Plan discusses the environmental investigations and the cleanup actions that were performed at ERP Sites SS003, SS008, SS011, and LF004, and describes the preferred **alternatives** for each site. The preferred alternatives can change in response to public comment or new information. More detailed information about each site can be found in reports located in the Administrative Record at Joint Base Elmendorf-Richardson (JBER) in Anchorage, Alaska, and at the website listed at the end of this Proposed Plan. The purpose of this Proposed Plan is to:

- Provide background information and describe environmental conditions at the sites.
- Describe alternatives that were considered for the sites, present the preferred alternative for each site, and describe the rationale for selecting the preferred alternative.
- Request comments from the public on all alternatives, as well as rationale for the preferred alternatives for each site.
- Provide information on how the public can be involved in the final decision.

The preferred alternative for SS003 includes bioremediation using in-situ landfarming and institutional controls (ICs). Areas of fuel contaminated surface soils and **sediments** exceeding defined preliminary remediation goals (PRGs) would be treated by landfarming until remaining soil is below PRG levels for all analytes. ICs would be implemented to prevent disturbance of remaining subsurface contaminants, and long term monitoring would be conducted to track groundwater contaminants.

The preferred alternative for SS008 includes soil excavation with off-site disposal, bioremediation using in-situ landfarming, and ICs. Polychlorinated biphenyl (PCB) and tetrachloroethene (PCE)-contaminated soil at SS008 would be excavated until remaining soil is below 1 milligram per kilogram (mg/Kg) for PCBs and below 0.024 mk/Kg for PCE. The PCB/PCE-contaminated soil would be transported to an appropriate disposal facility. Remaining areas of fuel-contaminated surface soil and sediment exceeding the PRGs would be treated by landfarming until the remaining soil is below PRG levels for all analytes. ICs would be implemented to prevent disturbance of remaining subsurface contaminants. Long term monitoring would be conducted to

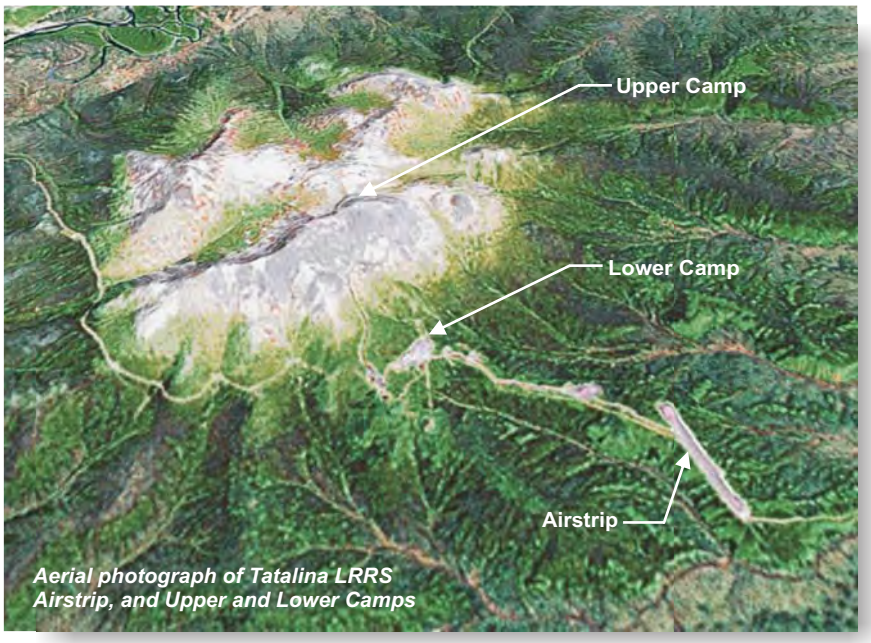
Proposed Plan: *a document required by Section 117(a) of CERCLA that informs Alaska Tribes, community leaders, and the public about contaminated sites, alternatives that were considered for cleaning up the sites, and which alternatives were identified as the preferred alternatives.*

Environmental Restoration Program (ERP): *a federal program initiated in the early 1980s to investigate and clean up old military facilities. The Air Force's CERCLA program. This program was formerly called the Installation Restoration Program (IRP).*

Alternatives: *appropriate cleanup or site management options that ensure protection of human health and the environment.*

Public Comment Period: *You are encouraged to comment on this Proposed Plan. The public comment period begins on May 7, 2012, and ends on June 6, 2012. Comments postmarked by June 6, 2012, will be addressed. Send your comments to:*

Tommie Baker, Community Relations, 611 CES/CEAR
10471 20th Street, Suite 340
Joint Base Elmendorf-Richardson, AK 99506-2201
(800) 222-4137



Aerial photograph of Tatalina LRRS Airstrip, and Upper and Lower Camps

track groundwater contaminants including free product encountered in well BH37/MW. Ground water monitoring will include samples collected from new well to be installed near the sediment sample that was found to contain PCE.

The preferred alternative for SS011 includes removal to the maximum extent possible of exposed drum debris and contaminated soil for off-site disposal. ICs would be implemented to prevent disturbance of remaining subsurface contaminants.

The preferred alternative for LF004 is ICs with Long-term Monitoring. ICs would be implemented to prevent disturbance of the landfill cover and buried wastes. Long-term Monitoring would consist of landfill cover inspections and downgradient groundwater and surface water sampling.

The Air Force has issued this Proposed Plan to solicit review and comments from the public participants on all alternatives and on the rationale for the preferred alternatives proposed for each of the four sites. The final decision on the preferred alternative would not be made until comments submitted by the end of the **public comment period** have been reviewed and considered. Changes to the preferred alternative may be made if public comments or additional data indicate that such changes would result in a more appropriate solution**.** Following public comment, a **Record of Decision** (ROD) will be issued that selects the final cleanup remedy. Public comments and responses to those comments will be included in the Record of Decision.

Regulatory Process

The ERP is the Air Force's program modeled after the U.S. Environmental Protection Agency's (EPA's) environmental cleanup program. Typically, the EPA is involved with cleanup activities to ensure compliance with applicable laws and regulations. Pursuant to the Department of Defense ERP, the Air


Airstrip in Summer

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): *a federal law established in 1980, modified in 1986, also known as "Superfund." CERCLA established a nationwide process for cleaning up hazardous waste sites that potentially endanger public health and the environment.*

Record of Decision: *as required by CERCLA Section 117(b), a document of the final cleanup decision under the site cleanup rules. The Record of Decision documents the rationale for selection of the final remedy.*

Responsiveness Summary: *a summary of oral and written public comments received during the comment period and the responses to those comments. The responsiveness summary is part of the Record of Decision.*

Sediment: *loose particles of sand or mud that are transported from their place of origin by moving water and deposited in unconsolidated layers.*

Force provides copies of site investigation documents to the EPA for their review and to keep them informed on site activities. In the past, the EPA has not provided comments on documents for Tatalina LRRS sites, generally deferring regulatory oversight to Alaska Department of Environmental Conservation (ADEC). Copies of the remedial investigation/feasibility study (RI/FS) reports for the four sites in this Proposed Plan were provided to the EPA and no comments were received; therefore, ADEC is the principle regulatory agency involved in the environmental restoration of these sites.

CERCLA

Preparation of this Proposed Plan and the associated public comment period are required under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These federal laws regulate the cleanup of hazardous waste sites that contain substances covered under CERCLA. Although the sites described in this Proposed Plan are not Superfund sites, the Air Force cleanup program follows CERCLA procedures when CERCLA hazardous substances are present at any of the sites at an installation. The steps involved in evaluation and cleanup of Air Force ERP sites are shown on Figure 2 and summarized below.

Preliminary Assessment.

In this first phase of the ERP process, investigators review records and interview former site workers. The investigators look for information about waste handling and fuels management to identify areas that might have been contaminated. Additional

Institutional Controls (ICs): *ICs are non-engineered instruments, such as administrative and legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of a remedy.*

Polychlorinated Biphenyls (PCBs): *a group of toxic, persistent chemicals used in transformers.*

Metals: *elements that occur naturally in the environment and are used in numerous products (i.e., sheet metal, drums, paint, batteries, etc.)*

Cleanup Levels: *concentrations or amounts of chemicals prescribed by state and federal regulations that have been determined to be protective of human health and the environment.*

Background Levels: *levels of naturally-occurring substances, such as metals, that are commonly found in the soil, sediment, or water of a region.*

PAHs: *a group of chemicals produced as byproducts of burning fuel.*

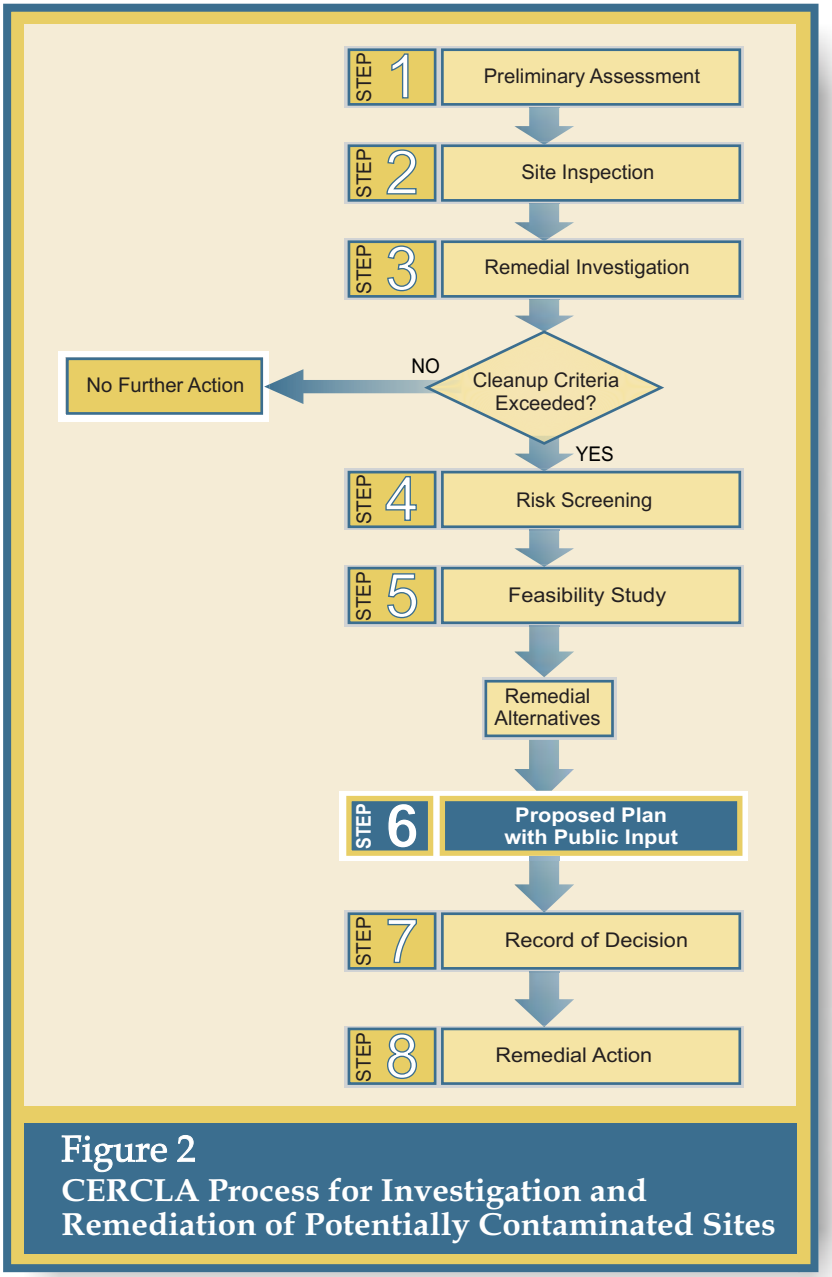


Figure 2
CERCLA Process for Investigation and Remediation of Potentially Contaminated Sites

Lower Camp SS003
Groundwater Monitoring

assessments may be conducted when new information is found, or new sites are identified.

Site Inspection. To follow up on findings from the preliminary assessment, investigators inspect potentially-contaminated sites and collect environmental samples. The purpose of the site inspection is to determine if contamination exists and if further investigations are warranted.

Remedial Investigation (RI). Based on the results of the site inspection, a more comprehensive investigation may be required. This investigation is called a RI. During the RI, environmental field crews collect samples of potentially contaminated media such as soil, sediment, groundwater, and surface water. The purpose of a RI is to determine the presence and/or extent of contamination, and to add to the knowledge gained in the site inspection to create a more complete picture of environmental conditions at a site. Additional samples may be collected and analyzed to determine naturally-occurring background concentrations in the different sample media.

Risk Screening. After the RI, a preliminary risk evaluation is conducted to evaluate potential risks to human health or the environment at each site. The goal of risk screening is to identify chemical contaminants that have a potential to cause risk to human health or the environment. Risk screening is performed for each media of concern (soil, sediment, water, air, and biota [plants and animals]). Two primary factors considered in risk screening are:

1. Whether significant levels of contaminants are present at a site, determined by comparing sample results with appropriate cleanup levels.
2. The likelihood of an exposure occurring, determined by the proximity of receptors to a site, the persistence of contaminants, and whether the toxicity thresholds for any chemical were exceeded.

In addition, results of the risk screening can be used to establish levels of chemicals in site media that may remain at a site and still be protective of human health and the environment.

Feasibility Study (FS). The purpose of a FS is to evaluate various remedial alternatives to address contamination in media identified at a site. The FS for ERP Sites SS003, SS008, and SS011 evaluated the feasibility of various remedial alternatives.

Proposed Plan. The preferred alternative for a site is presented to the public in a Proposed Plan. The Proposed Plan briefly summarizes the alternatives studied in the detailed analysis of the RI/FS, highlighting the key factors that led to identifying the preferred alternative.

Record of Decision. The ROD documents the remedial action plan for a site and serves the following three basic functions:

- Certifies that the remedy selection process was carried out in accordance with CERCLA and, to the extent practicable, with the NCP.
- Describes the technical parameters of the remedy, specifying the methods selected to protect human health and the environment, including; treatment, engineering, and IC components, as well as cleanup levels.
- Provides the public with a consolidated summary of information about the site and the chosen remedy, including the rationale behind the selection.

Interim Removal Actions. Interim removal actions and time critical removal actions are generally short-term response actions taken to abate or mitigate imminent substantial threats to human health and the environment and are generally surface cleanups. These actions can be triggered by burning, leaking, explosion, or other hazardous occurrences that cannot wait for remedial action.

Remedial Action. After completion of the Record of Decision, the remedial action begins. During the remedial action, the implementation phase of site cleanup occurs. Upon completion of the remedial action for a site, a Remedial Action Report and Preliminary Site Closure Report are prepared that document NCP site construction completion.

Following consideration of public comments received on this Proposed Plan, the Air Force will prepare a Record of Decision to document the final selected remedies for these four sites. The Record of Decision contains a summary of responses to public comments **(Responsiveness Summary)**.

CERCLA Petroleum Exclusion

CERCLA Section 101(14) excludes certain substances from the definition of hazardous substance, thus exempting them from CERCLA. These substances include petroleum, meaning "crude oil or any fraction thereof." The EPA interprets this to include hazardous substances that are normally mixed with or added to crude oil or crude oil fractions during the refining process. Contamination resulting from spills of heating oil, diesel fuel, jet fuel, and gasoline are exempt from CERCLA. However, in Alaska, sites that are contaminated with releases of petroleum products or other hazardous substances are addressed by ADEC under the contaminated sites regulations (18 Alaska Administrative Code [AAC] 75, Article 3, Discharge Reporting Cleanup and Disposal of Oil and Other Hazardous Substances).

Contamination at ERP Sites SS003, SS008, and SS011 is almost entirely from spills of petroleum products and the investigations and cleanup fall under State of Alaska regulations and not CERCLA. The exception is at site SS011 and the area of PCB and PCE soil contamination at SS008 to which CERCLA applies. LF004 is a former landfill that received municipal solid waste from Tatalina LRRS, but since no CERCLA hazardous substances have been detected, the landfill will be managed under 18 AAC 75.

Site Background

Tatalina LRRS is a remote site, accessible only by air and water, located 10 miles southeast of Takotna by road, and 240 miles northwest of Anchorage. The site was constructed as an Aircraft Control and Warning facility in 1952, and became operational in the same year. A White Alice Communications System (WACS)

View of Airstrip, LF004, and SS008

was built at the site and activated in 1957. A Minimally Attended Radar (MAR) was installed in 1985 and remains active to date. The site was converted to Long Range Radar in 1983. Four contractor personnel currently are assigned to operate and maintain the facilities for the Air Force. Site operations are planned to continue indefinitely.

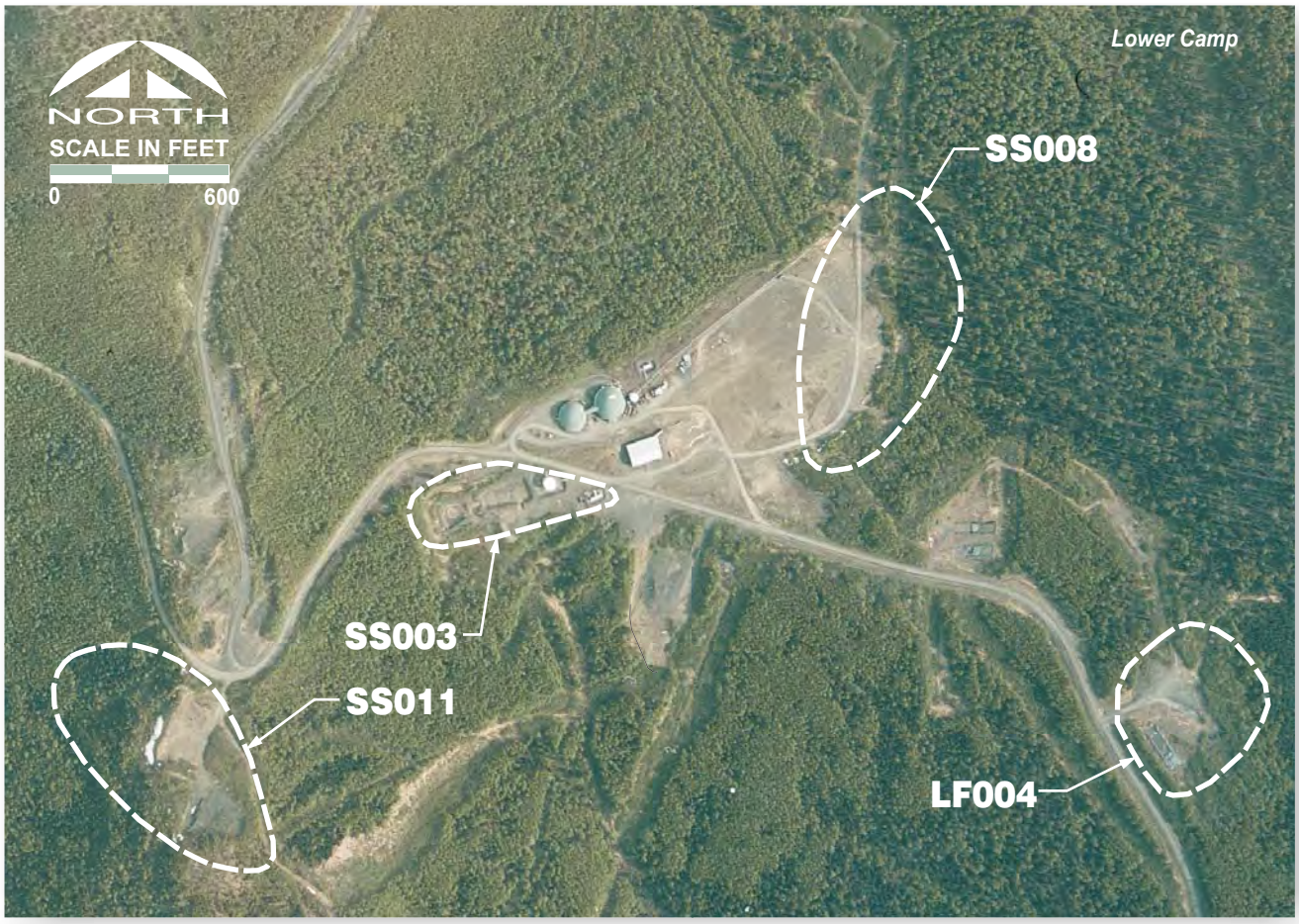
Tatalina LRRS consists of 4,968 acres located in the upper Kuskokwim River area. The installation consists of four areas: Upper Camp on Takotna Mountain, where radar facilities are located; Lower Camp, where residential and support facilities are located; the Airstrip; and the Sterling Landing (a barge landing) site along the Kuskokwim River.

Upper Camp is located at the summit of Takotna Mountain. The LRRS radar facilities and a small structure to house the MAR are located at Upper Camp.

Lower Camp is located on the southern flank of Takotna Mountain, at an elevation of approximately 1,250 feet. A living dome, an industrial dome, several aboveground storage tanks used for fueling vehicles and equipment, as well as ERP Sites SS003, SS008, SS011, and LF004, are located at Lower Camp. The Airstrip is about 2 miles southeast of Lower Camp, at an elevation of about 890 feet. The sources of contaminants of concern at SS003, SS008, SS011, and LF004 are POL tanks, waste accumulation areas, and landfill area.

Site Characteristics

The following sections provide physical descriptions and investigative histories for ERP Sites SS003, SS008, SS011, and LF004.



SS003 POL Tank Farm

The primary area of SS003 consists of the former POL Tank Farm and the area of targeted remediation is approximately 20,000 square feet. This site is located at Lower Camp (Figure 3).

Records indicate that a liner was installed in the bermed POL Tank Farm area in 1983. Three bulk diesel storage tanks and two bulk motor vehicle gasoline (MOGAS) storage tanks were removed in 1993.

Between 1997 and 2004, four Remedial Investigations (RIs) were conducted at SS003. Notable observations include a 1997 finding that fuel leaks/spills infiltrated vertically in the POL Tank Farm area until reaching the groundwater interface, and then spread horizontally. The 2002 investigation confirmed that shallow soil concentrations within the bermed areas contained the greatest hydrocarbon concentrations; while soil located a short distance downgradient contained moderate concentrations. The 2003 investigation confirmed the contaminated soil in the POL Tank Farm was a continuing source of contamination of groundwater downgradient of the tank farm. Depth to groundwater at this site ranged from 12.85 feet below ground surface (bgs) to 7.70 feet bgs in 2003. In addition, after the removal of the liner in 2004, POL contaminants were still present in the soil immediately below the tank pits and the downgradient soil and groundwater.

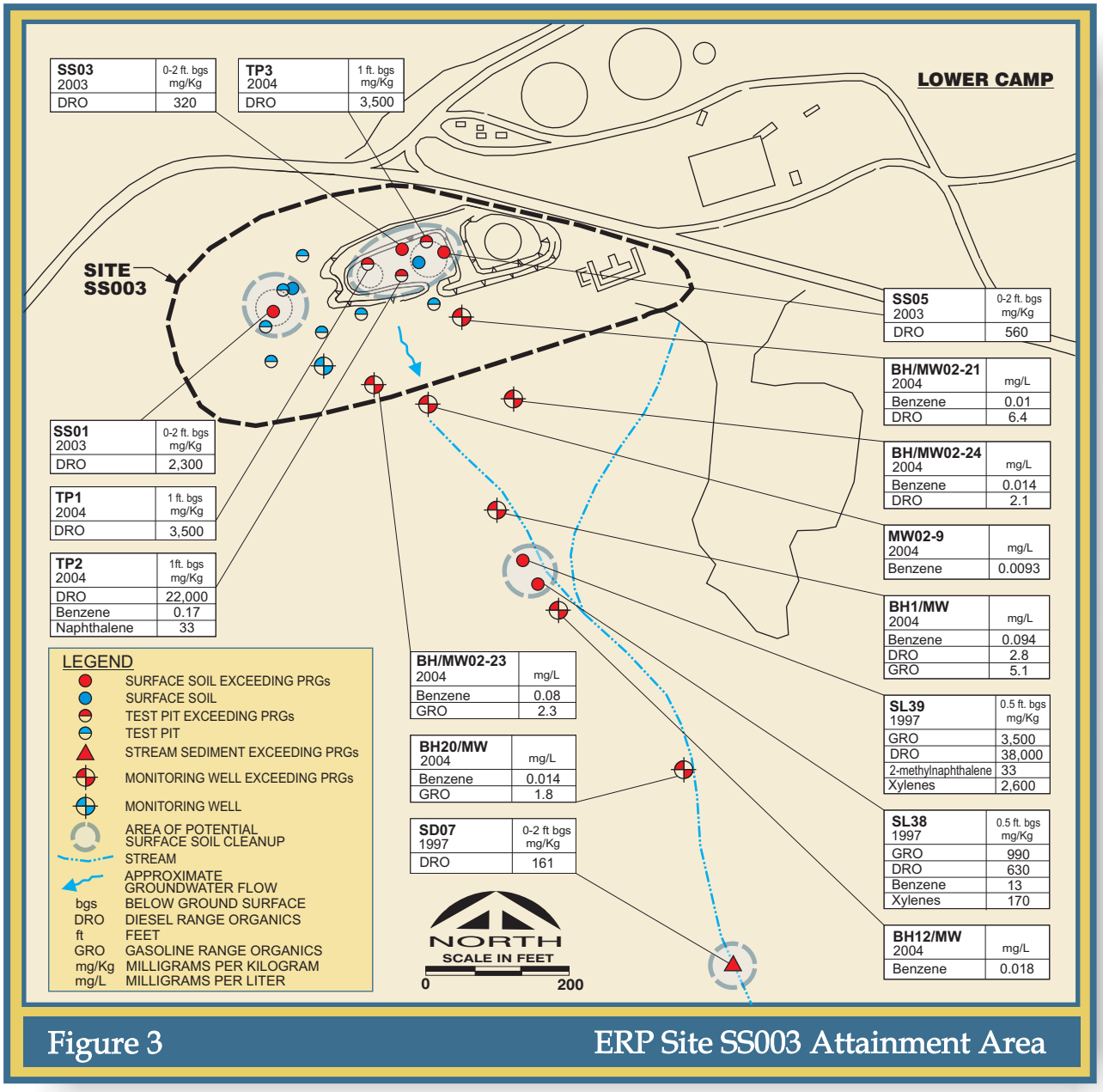


Figure 3 ERP Site SS003 Attainment Area

Diesel range organics (DRO) concentrations in the soil samples ranged from not detected to 38,000 mg/Kg. The source of this DRO contamination was described in the 1997 RI report to be an isolated incident, with a separate, non-pervasive spill source. The subsurface soil pathway is incomplete and will not be considered further. Petroleum is the only contaminant of concern at SS003, which is not included in CERCLA's definition of hazardous substances and, is therefore, not subject to CERCLA reporting, response, or liability requirements; therefore, no action for petroleum is proposed under CERCLA. Action under State of Alaska regulations is required for the petroleum contamination.

SS008 Waste Accumulation Area Number 4

The primary area of SS008 consists of Waste Accumulation Area Number 4 and the area of targeted remediation is approximately 10,000 square feet. This site is located at Lower Camp (Figure 4). Eleven boreholes were completed in 1997 and 1999. Only two had PCB contamination. These are likely isolated incidents, because one borehole location is in a separate small clearing, and the other had nearby

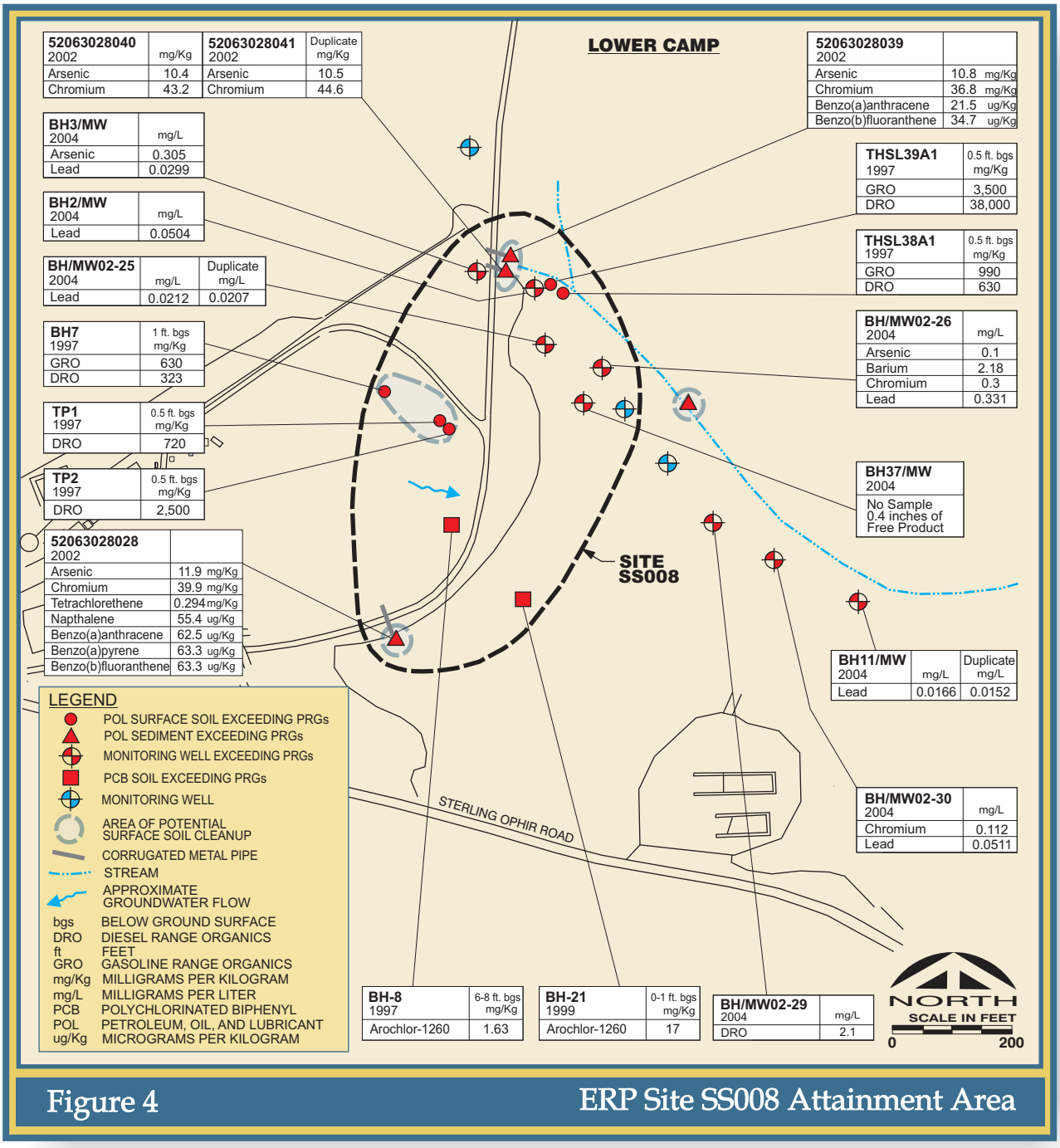


Figure 4 ERP Site SS008 Attainment Area

boreholes without PCB detections. PCBs were detected above ADEC cleanup levels in the surface soil of Boring BH-21 and subsurface soil of Boring BH-8. PCE was detected in one sediment sample, but not in neighboring boreholes or monitoring wells. Most notably, one monitoring well had free product during the 2002, 2003, and 2004 investigations. The 2002 and 2003 reports concluded that the free product was limited, and confined to the base or toe of the slope of the hill. In 2004, DRO was detected in a monitoring well downgradient from the well with free product, most likely representing migration of contaminants. DRO results ranged from not detected to 2.1 milligrams per liter (mg/L). Breakdown products from pesticides were detected above ADEC cleanup levels at SS008. These pesticides were applied to the entire installation and therefore, will not be considered for remediation. The subsurface soil pathways is incomplete and will not be considered further. The petroleum contamination at this site is not subject to CERCLA reporting, response, or liability requirements; therefore, no action is proposed under CERCLA for petroleum. Treatment of PCB and PCE contaminated soils are subject to CERCLA requirements. Action under State of Alaska regulations is required for the petroleum contamination.

SS011 Waste Accumulation Area Number 1

The primary area of SS011 consists of Waste Accumulation Area Number 1 and is located at Lower Camp (Figure 5).

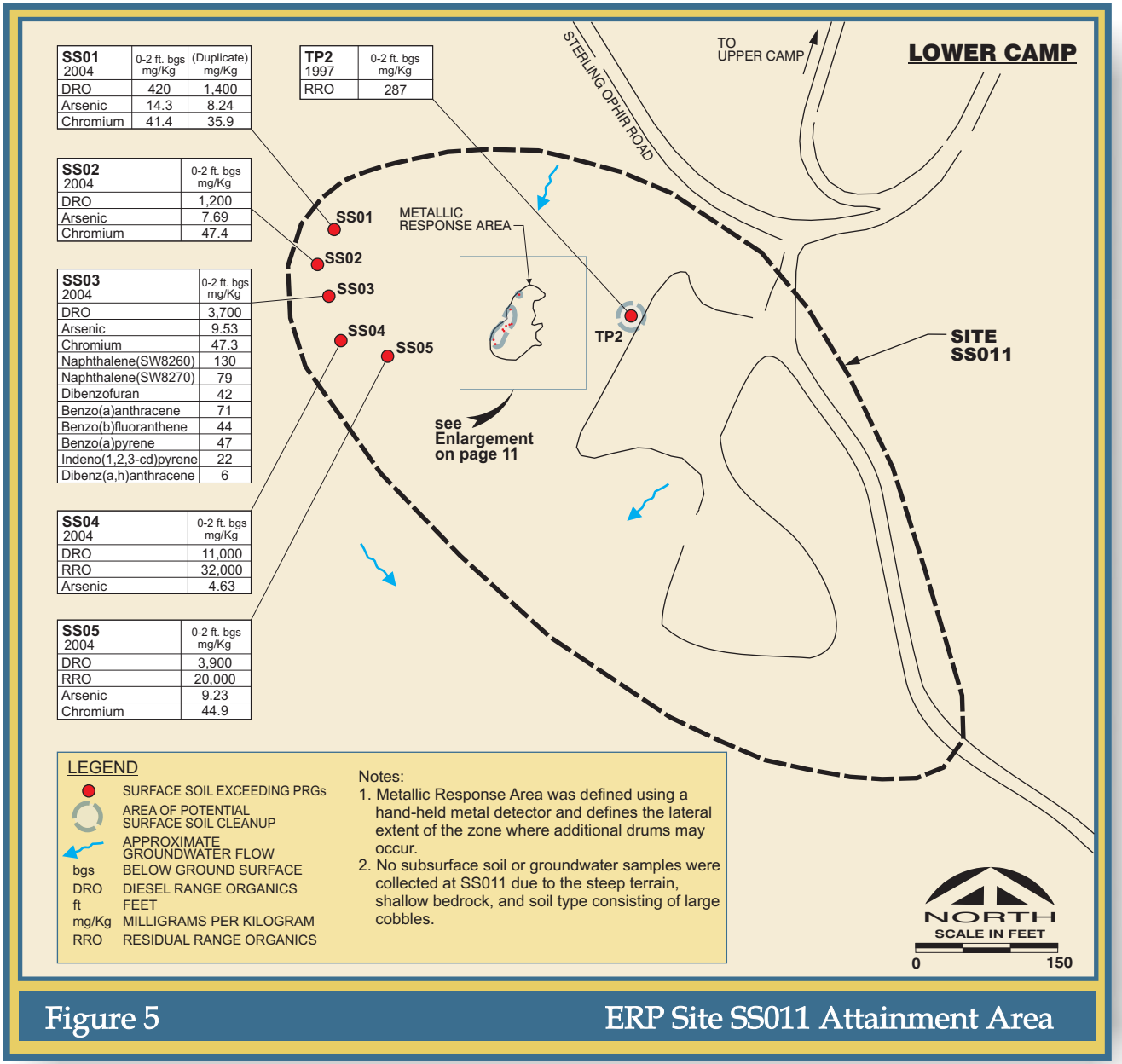
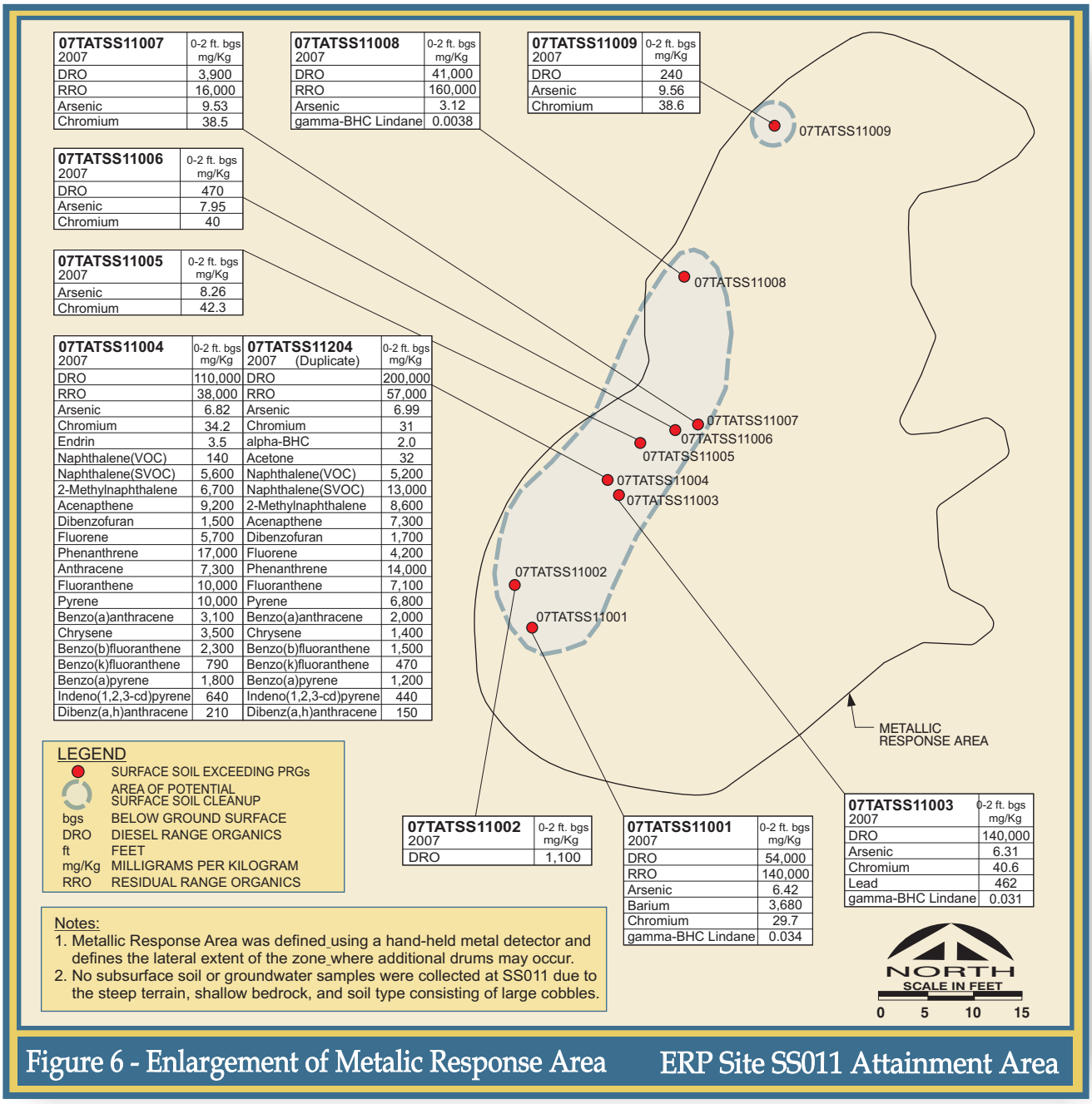


Figure 5 ERP Site SS011 Attainment Area

Between 1997 and 2007, five RIs were conducted at SS011. There were multiple removal actions to remove the stored waste drums. The 1997 report indicated neither PCBs nor petroleum hydrocarbons (PHCs) were present above ADEC Method Two cleanup levels. The 2003 report indicated there was no evidence of petroleum product contamination in surface water or sediment downgradient from the buried waste drums. In 2004, surface samples downgradient of the slope where waste drums were exposed and removed had residual range organics (RRO) results ranging from 2,300 to 32,000 mg/Kg; and DRO results ranged from 420 to 11,000 mg/Kg. One sample had polynuclear aromatic hydrocarbons (PAHs) detected at higher concentrations than the other samples, representing a hotspot.

Ten partially-exposed drums were documented in 2007 and remain on site, and a magnetometer coupled with a high accuracy global positioning system (GPS) was used to determine the potential extent of possible buried drums. The extent of potentially-buried debris registering a magnetic signal was approximately 2,500 square feet. Surface soils collected from the stained area beneath the 10 drums had results for DRO ranging from 240 to 200,000 mg/Kg, while RRO results ranged from 700 to 160,000 mg/Kg. No subsurface soil or groundwater samples were collected at SS011 due to the steep terrain, shallow bedrock, and soil type consisting of large cobbles. The petroleum contamination at this site is not subject to CERCLA reporting, response, or liability; therefore, no action is proposed under CERCLA for petroleum.



07TATSS11007 2007	0-2 ft. bgs mg/Kg
DRO	3,900
RRO	16,000
Arsenic	9.53
Chromium	38.5

07TATSS11008 2007	0-2 ft. bgs mg/Kg
DRO	41,000
RRO	160,000
Arsenic	3.12
gamma-BHC Lindane	0.0038

07TATSS11009 2007	0-2 ft. bgs mg/Kg
DRO	240
Arsenic	9.56
Chromium	38.6

07TATSS11006 2007	0-2 ft. bgs mg/Kg
DRO	470
Arsenic	7.95
Chromium	40

07TATSS11005 2007	0-2 ft. bgs mg/Kg
Arsenic	8.26
Chromium	42.3

07TATSS11004 2007	0-2 ft. bgs mg/Kg	07TATSS11204 2007 (Duplicate)	0-2 ft. bgs mg/Kg
DRO	110,000	DRO	200,000
RRO	38,000	RRO	57,000
Arsenic	6.82	Arsenic	6.99
Chromium	34.2	Chromium	31
Endrin	3.5	alpha-BHC	2.0
Naphthalene(VOC)	140	Acetone	32
Naphthalene(SVOC)	5,600	Naphthalene(VOC)	5,200
2-Methylnaphthalene	6,700	Naphthalene(SVOC)	13,000
Acenapthene	9,200	2-Methylnaphthalene	8,600
Dibenzofuran	1,500	Acenapthene	7,300
Fluorene	5,700	Dibenzofuran	1,700
Phenanthrene	17,000	Fluorene	4,200
Anthracene	7,300	Phenanthrene	14,000
Fluoranthene	10,000	Fluoranthene	7,100
Pyrene	10,000	Pyrene	6,800
Benzo(a)anthracene	3,100	Benzo(a)anthracene	2,000
Chrysene	3,500	Chrysene	1,400
Benzo(b)fluoranthene	2,300	Benzo(b)fluoranthene	1,500
Benzo(k)fluoranthene	790	Benzo(k)fluoranthene	470
Benzo(a)pyrene	1,800	Benzo(a)pyrene	1,200
Indeno(1,2,3-cd)pyrene	640	Indeno(1,2,3-cd)pyrene	440
Dibenz(a,h)anthracene	210	Dibenz(a,h)anthracene	150

07TATSS11002 2007	0-2 ft. bgs mg/Kg
DRO	1,100

07TATSS11001 2007	0-2 ft. bgs mg/Kg
DRO	54,000
RRO	140,000
Arsenic	6.42
Barium	3,680
Chromium	29.7
gamma-BHC Lindane	0.034

07TATSS11003 2007	0-2 ft. bgs mg/Kg
DRO	140,000
Arsenic	6.31
Chromium	40.6
Lead	462
gamma-BHC Lindane	0.031

Figure 6 - Enlargement of Metalic Response Area ERP Site SS011 Attainment Area

LF004 Landfill Number 2

The primary area of LF004 consists of Lower Landfill Number 2 and is approximately 4 acres in size. This site is located at Lower Camp (Figure 7).

Between 1992 and 1999, three RIs were conducted at LF004. No contaminants of concern were detected above ADEC cleanup levels for surface soil, subsurface soil, groundwater, or downgradient surface water and sediment samples. The 1997 RI did not investigate the active portions of the landfill. One soil boring was drilled and converted to a monitoring well, and then sampled for subsurface soil, and groundwater. In 1999, test holes were excavated into the cover of the landfill to verify that it was at least 2 feet thick.

A new landfill was constructed in 2002, covering approximately 80 percent of the former landfill. The remaining 20 percent is being visually inspected by the Tatalina LRRS Base Operations Contractor on a regular basis. In 2003, a small area of exposed debris was covered.

Figure 7 ERP Site LF004 Attainment Area

A risk assessment completed in 1997 for LF004 indicated contaminant concentrations were below human health risk-based levels. Ecological risk drivers were determined to be 4,4'- dichlorodiphenyldichloroethane (DDD), 4,4'- dichlorodiphenyldichloroethylene (DDE), and 4,4' - dichlorodiphenyltrichloroethylene (DDT). These analytes are breakdown products from pesticides that were legally applied to the entire installation, were detected below ADEC Method Two soil cleanup levels, and, therefore, will not be considered for further remediation. No analytes included in CERCLA's definition of hazardous substances have been detected at this site; therefore, LF004 is not subject to CERCLA reporting, response, or liability requirements; and no action is proposed under CERCLA.


Upper Camp Dome

Summary of Site Risk

As part of the RI, a baseline risk assessment was conducted in 2009 based on data from the four RIs conducted between 1997 and 2004 to estimate the potential current and future effects of contaminants on human health and the environmental at ERP Sites SS003, SS008, and SS011.

Tatalina LRRS has one nearby community connected by road, but access to the site is limited to Air Force-approved activities. The four ERP sites contain no occupied structures and the Air Force uses the lands at SS003 for storage and dispensing diesel and MOGAS. Part of LF004 is currently used as an active landfill. There are no current plans for future development at any of the sites. The current land use is expected to remain the same over the foreseeable future.

It is the Air Force's current judgment that the preferred alternative identified for each ERP Site in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health, welfare, or the environment from actual or threatened releases of **hazardous substances** at the sites into the environment.

Receptors: *living organisms that may be affected by site contamination. Human receptors may include site workers, subsistence users, and site visitors. Potential ecological receptors consist of terrestrial and aquatic wildlife and plant species.*

Toxicity Threshold: *a criterion used in risk screening to evaluate how toxic a potential exposure to a contaminant could be. The toxicity threshold is exceeded when:*

The duration or frequency of exposure is sufficient to cause adverse health or environmental effects, AND

One of the following is met:

-The measured concentration of at least one contaminant exceeded the ADEC cleanup level or other appropriate criteria, OR

-One or more contaminants exhibit high toxicity to ecological receptors.

Human Health Risk

Using the data collected from 1997 to 2004 at SS003, SS008, and SS011, an updated human health risk assessment was conducted in 2009. Source areas were first evaluated to determine where human receptors might be exposed to site contaminants. Possible exposure pathways were evaluated to see which routes of exposure were complete. A complete exposure route is one in which site contaminants can get from the contaminated media, such as soil or groundwater, to humans. Inhalation of contaminated dust, incidental ingestion of soil or water, or dermal exposure to contaminated soil or water are exposure routes evaluated at Tatalina LRRS. Based on this evaluation, it was determined that potentially significant complete exposure pathways between site workers and soil chemicals of potential concern (COPCs) include incidental oral, dermal, and inhalation contact with soil, soil particulates, sediments, surface water, or subsurface water. Human health risks were calculated for carcinogenic (cancer causing) and non-carcinogenic contaminants. The results of those calculations were compared against conservative risk management standards set by ADEC. The selected values

derived from the risk assessmentand finalized in the FS for SS003, SS008, and SS011 are summarized in Preliminary Remediation Goal (PRG) Tables 1, 2, and 3, respectively.

Table 1 SS003 - Preliminary Remediation Goals

Media	Parameter	PRG	Maximum Concentration	EPC
Human Health				
Surface Soil [1]	Naphthalene	81	160	51
	1,2,4-Trimethylbenzene	116	1,400	431
	1,3,5-Trimethylbenzene	82	510	81
Groundwater [2]	Benzene	0.005	0.35	0.12
	Ethylbenzene	0.7	0.41	0.14
	3,3'-Dichlorobenzidine	0.0019	0.005	0.0050
	Bis(2-chloroethyl) Ether	0.00077	0.0005	0.00050
	Hexachlorobutadiene	0.0073	0.003	0.0030
	DRO	1.5	6.4	3.5
	GRO	2.2	7.5	3.4
	RRO	1.1	1.00	3.4
Ecological Receptors				
Surface Soil [1]	Total Xylenes	2,029	2,600	2,600
	DRO	1,000 [3]	38,000	14,251
	GRO	347	3,500	629
	RRO	11,000 [4]	1,260	605
Sediment [1]	Bis(2-ethylhexyl)phthalate	0.19	0.9	0.90

Key:
1. Concentrations reported in milligrams per kilogram (mg/Kg).
2. Concentrations reported in milligrams per liter (mg/L), ADEC Table C cleanup levels were used to establish PRGs for these parameters.
3. This value represents a remedial target for land farming that was mutually agreed upon by the Air Force and ADEC on April 10, 2012.
4. The ADEC Method Two cleanup level for the migration groundwater pathway, for under 40 inches of precipitation, was used to establish the PRG for this parameter.

ADEC - Alaska Department of Environmental Conservation
DRO - Diesel Range Organics
EPC - Exposure Point Concentration
GRO - Gasoline Range Organics
PRG - Preliminary Remediation Goal, based on the risk-based cleanup level.
RRO - Residual Range Organics

The risk assessment found that exposure pathways were complete for both current and future site workers, trench workers, and recreational hunters for surface soil (SS003, SS008, and SS011) and groundwater (SS003 and SS008). The exposure pathways for subsurface soil were also complete; however, these results were below the conservative ADEC risk management standards at SS003 and SS008. Results of the ADEC-approved human health risk assessment indicate there is a risk to site workers from naphthalene (SS003 and SS011), PCBs (SS008), DRO (SS011), RRO (SS011), and various PAHs (SS011). The risk assessment also indicated there is a risk to site workers from arsenic at SS003; however, these levels have been determined to be within the areas background levels. In 1997, no COPCs were identified as human health risks for ERP Site LF004.

Ecological Risks

The updated ecological risk assessment concluded that there are complete exposure pathways between ecological **receptors** at Tatalina LRRS for terrestrial birds and mammals in surface soil, subsurface soil, sediment, and surface water media for direct contact pathways, including incidental ingestion, dermal contact,

Table 2 SS008 - Preliminary Remediation Goals

Media	Parameter	PRG	Maximum Concentration	EPC
Human Health				
Surface Soil [1]	PCB (Aroclor 1260)	1[3]	17	11.50
Groundwater [2]	1,2-Dibromomethane	0.00005	0.001[5]	0.0010
	2-Methylnaphthalene	0.15	0.464	0.46
	DRO - Aliphatic	1.5	152	36
	DRO - Aromatic	1.5	76	36
	Lead	0.015	0.331	0.087
Ecological Receptors				
Surface Soil [1]	PCB (Aroclor 1260)	1	17	12
	DRO	1,000 [6]	2,500	2,159
	GRO	323	630	630
	RRO	11,000[4]	529	529
Sediment [1]	DRO	265	2,740	2,506
	RRO	22	1,190	871
	PCE	0.024[4]	0.294	NC

Key:
1. Concentrations reported in milligrams per kilogram (mg/Kg).
2. Concentrations reported in milligrams per liter (mg/L), ADEC Table C cleanup levels were used to establish PRGs for these parameters.
3. Method 2 default clean-up level based upon the Federal TSCA regulations.
4. The ADEC Method Two cleanup level for the migration-to groundwater pathway, for under 40 inches of precipitation, was used to establish the PRG for this parameter.
5. With the exception of two samples from 1997 with reported concentrations, the analyte was not detected in all samples. However, the Method Reporting Limit (MRL) is greater than the PRG for all nine samples indicated to have concentrations above PRG.
6. This value represents a remedial target for land farming that was mutually agreed upon by the Air Force and ADEC on April 10, 2012.

ADEC - Alaska Department of Environmental Conservation
DRO - Diesel Range Organics
EPC - Exposure Point Concentration
GRO - Gasoline Range Organics
NC - Not calculated
PCE - Tetrachloroethene
PRG - Preliminary Remediation Goal, based on RBCL (Risk-Based Cleanup Level)
RRO - Residual Range Organics
TSCA - Toxic Substances Control Act

and inhalation of dust. The pathways for subsurface soil were incomplete for ecological receptors. Concentrations of metals were similar to concentrations measured in background samples and are not considered for evaluation. Primary ecological risk-drivers include: PCBs (SS008), chlorinated pesticides (SS011), various PAHs (SS011), gasoline range organics (GRO) (SS003), DRO (SS003, SS008, and SS011), and RRO (SS003, SS008, and SS011). Although three chemicals of potential ecological concern (COPECs) were identified during an ecological risk assessment at LF004 in 1997, they were breakdown products of pesticides that were legally applied, therefore, will not be considered for further remediation.

Remedial Action Objectives

Remedial action objectives (RAOs) are the short- and long-term goals established for each of the four ERP sites. Based on the findings of the investigations and risk assessments conducted at each site, the RAOs for these sites are to protect against oral ingestion, dermal contact, or inhalation of contaminated soil and groundwater.

Table 3 SS011 - Preliminary Remediation Goals

Media	Parameter	PRG[4]	Maximum Concentration	EPC
Human Health				
Surface Soil [1]	Benzo(a)anthracene	24	3,100	950
	Benzo(a)pyrene	2.4	1,800	286
	Benzo(b)fluoranthene	24	2,300	705
	Benzo(k)fluoranthene	239	790	166
	Chrysene	2,389	3,500	1,066
	Dibenz(a,h)anthracene	2.4	210	34
	Indeno(1,2,3-cd)pyrene	24	640	103
	Naphthalene	81	13,000	3,555
	Alpha-BHC	3	2	0.70
	2-Methylnaphthalene	2,492	8,600	3,697
	Naphthalene[2]	287	13,000	3,555
	DRO	12,500[3]	200,000	79,575
	RRO	22,000[3]	160,000	60,057
Ecological Receptors				
Surface Soil [1]	2-Methylnaphthalene	3.356	8,600	3,697
	Acenaphthene	9.898	9,200	2,800
	Anthracene	6.065	7,300	2,230
	Benzo(a)anthracene	7.241	3,100	950
	Benzo(a)pyrene	10.915	1,800	286
	Benzo(b)fluoranthene	5.650	2,300	705
	Benzo(g,h,i)perylene	5.004	740	229
	Benzo(k)fluoranthene	0.791	790	166
	Chrysene	6.404	3,500	1,066
	Dibenz(a,h)anthracene	2.476	210	34
	Fluoranthene	4.841	10,000	3,063
	Fluorene	1.549	5,700	1,744
	Indeno(1,2,3-cd)pyrene	5.142	640	103
	Naphthalene	3.356	13,000	3,555
	Phenanthrene	8.487	17,000	5,177
	Pyrene	8.344	10,000	3,029
	Endrin	0.119	3.5	0.61
	Endrin aldehyde	0.119	2.9	0.94
	Endrin ketone	0.119	2.2	0.75
	DRO	12,500[3]	200,000	79,575
	RRO	22,000[3]	160,000	60,057
Sediment [1]	RRO	36	342	342

Key:
1 Concentrations reported in milligrams per kilogram (mg/Kg).
2 Non-cancer Hazard Index.
3 The Alaska Department of Environmental Conservation Method Two Cleanup level for inhalation, for under 40 inches of precipitation, was used to establish the PRG for this parameter.
4. The more conservative value between Human Health and Ecological Receptors will be used as the clean-up goal.
DRO - Diesel Range Organics
EPC - Exposure Point Concentration
PRG - Preliminary Remediation Goal, based on RBCL (Risk-Based Cleanup Level).
RRO - Residual Range Organics

Based on the risk assessment results, RAOs for SS003 are:

- Prevent human, mammalian, and avian species exposure to soil impacted by historical fuel spills inside and south of the bermed areas where fuel tanks once stood.
- Prevent future human exposure to petroleum-contaminated groundwater downgradient of the old POL Tank Farm.


SS003
AST Tank Liner Removal

Based on the risk assessment results, RAOs for SS008 are:

- Prevent current and future human and ecological receptor exposure to petroleum and PCB contaminated surface soil on the eastern side of the pad where the old Lower Camp once stood.
- Prevent future human exposure to petroleum-contaminated groundwater and avian species exposure to petroleum-contaminated sediment downgradient of the old Lower Camp pad.

Based on the risk assessment results, RAOs for SS011 are:

- Prevent current and future human exposure to petroleum and pesticide contaminated surface soil on the slope immediately west of the Waste Accumulation Area No. 1.
- Prevent exposure of mammalian and avian species to petroleum and pesticide contaminated surface soil at SS011.

Summary of Alternatives

Remedial alternatives for ERP Sites SS003, SS008, SS011, and LF004 will be selected and implemented after final input is received from interested parties or stakeholders. Each alternative was evaluated against nine criteria established under CERCLA (Table 4).

Table 4 Nine Remedial Alternative Evaluation Criteria Under CERCLA

Evaluation Criteria	Definition
Overall Protection of Human Health and the Environment	Does the alternative protect human health and the environment through elimination, reduction, or control of contaminated areas?
Compliance with Applicable or Relevant and Appropriate Requirements	Does the alternative meet cleanup standards and comply with applicable government laws and regulations?
Long-term Effectiveness and Permanence	How well does the alternative protect human health and the environment after cleanup, and are there any risks remaining at the site?
Reduction of Toxicity, Mobility and Volume through Treatment	Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility, and volume of the hazardous substances?
Short-term Effectiveness	Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative and how effective is the remedial alternative in the short-term?
Implementability	Is the alternative both technically and administratively feasible?
Cost	What are the capital and operating and maintenance costs of the alternative?
State Acceptance	Is the alternative acceptable to the state (ADEC)?
Community Acceptance	Does the community accept the Air Force's preferred alternatives?

The remedial alternatives considered in the FS to address contaminated media at these four ERP sites is provided in Table 5 and discussed below.

CERCLA Hazardous Substance:
a chemical that presents an imminent and substantial danger to the public health or welfare if it is released to the atmosphere, surface water, groundwater, or land surface. Regulatory definitions can be found in CERCLA 101(14) and 102 and the NCP 40 CFR 300.5.

No Action

CERCLA requires that the "No Action" alternative be evaluated to establish a baseline for comparison. Under this alternative, the Air Force would take no action at the site to prevent exposure to the soil and groundwater contamination. The No Action alternative assumes that the site would be left "as is" i.e., in its current condition. No Action is a response action selected when no additional remedial actions are necessary to protect human health and the environment. No Action status should be noted in Air Force and ADEC records.

Institutional Controls Only

This alternative consists of notices being placed in Land Records and the Base Master Plan. These notices will document the contamination and restrict use of the site to prevent disturbance of surface/subsurface soil and surface/groundwater. This would eliminate the exposure pathway that the unacceptable human risk determination is based on. However, this option would not prevent potential migration of contaminants from wind or water erosion and would not reduce leaching or runoff, nor would it reduce potential ecological risks.

Soil Cover with Institutional Controls

This alternative consists of using local material to construct a cover for the areas of SS003 and SS008 that contain contaminants above the PRG level to eliminate exposure to contaminated surface soil. Soil covers would be graded to promote drainage. The covers would require periodic monitoring to ensure they remain effective and might require maintenance if the integrity of the cover becomes diminished. ICs, in the form of a Notice in the Base Master Plan, and other notices in the land records would be implemented and excavation in the affected areas would be prohibited.

Natural Attenuation

This alternative consists of allowing native biological, physical, and chemical processes to reduce contaminant concentrations. The rate at which natural processes operate is highly variable, depending on the media, specific process, and site conditions. A key component of this approach is to consider and monitor multiple processes, as well as track the individual processes, in order to estimate the overall rate and extent of attenuation.

Table 5 — **Summary Alternatives**

Remedial Alternative	POL Soil Remediation Alternative	POL Groundwater Remediation Alternative	CERCLA-PCB and PCE Remediation Alternative
No Action	✓	✓	✓
Institutional Controls	✓	✓	✓
Soil Cover with Institutional Controls	✓		✓
Natural Attenuation	✓	✓	
Chemical Oxidation	✓		
Thermal Treatment	✓		
Excavation and Off-site Landfilling	✓		✓ At TSCA Facility
Bioremediation (In-situ Landfarming)	✓		
Enhanced Bioremediation		✓	
Active Pumping with Air Stripping		✓	
Active Pumping with Filtration using Granular Activated Carbon		✓	

Key: CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
PCB - Polychlorinated biphenyl
POL - Petroleum , Oil, and Lubricant
TSCA - Toxic Substances Control Act
✓ Matrix of Application of Remedial Alternative

Chemical Oxidation

A strong oxidizing agent can be added to the surface and subsurface soils to break chemical bonds in organic contaminants of concern. This is a chemical reaction that requires an oxidizing chemical (peroxide, permanganate, persulfate, or ozone) to come in contact with the contaminant. The chemical reaction occurs relatively quickly to destroy the contaminant. The breakdown products are carbon dioxide, water, and other harmless compounds - depending on the contaminant. The oxidant can be applied by mixing a reagent directly into the soil, thus eliminating low in-situ soil temperature as a limiting factor.

SS003
AST Tank Liner Removal

Thermal Treatment

This remediation alternative consists of excavating soil with contaminant concentrations exceeding PRGs and subsequent disposal by combustion. The soil is heated in a sealed combustion chamber to remove or desorb contaminants. PHCs are the contaminant most commonly remediated using this technology. Temperatures and residence times used in thermal desorption units volatilize the contaminants, which are then emitted to the atmosphere.

Excavation and Off-site Landfilling

This remediation alternative consists of excavating soil with contaminant concentrations exceeding PRGs, and transporting the excavated soil to an off-site landfill or soil recycling and disposal facility. Most of the contaminants at the sites are PHCs, which could be landfilled at a number of permitted facilities. Soil containing CERCLA hazardous substances will be landfilled at a facility permitted to accept Toxic Substances Control Act (TSCA) wastes.

Bioremediation (In-situ Landfarming)

This remediation alternative involves landfarming of soils where contaminant concentrations exceed the PRGs, which includes stimulation of aerobic microbial activity through aeration and/or application of minerals, nutrients, and moisture. This would result in a reduction of contaminant concentrations through volatilization and enhanced microbial metabolization of hydrocarbons adsorbed to soil. For surface soil contamination, this can be accomplished in situ without the need to excavate or relocate the soil.

Enhanced Bioremediation

Adding oxygen to a groundwater source area can enhance bacterial metabolizing of PHCs and other non-halogenated organic compounds. To increase the dissolved oxygen concentration in groundwater, compounds are added that interact with water and slowly release oxygen into the water. The oxygen-releasing compounds (ORCs) are placed in the saturated zone and allowed to react with water over an extended period. Increased dissolved oxygen concentrations would enhance bacterial growth in the saturated zone directly downgradient of the point where the ORCs are placed.

Active Pumping with Air Stripping

Air injected into an aquifer via sparge points induces contaminant volatilization in groundwater and enhances biodegradation in the vadose zone. Air sparging is often applied in tandem with a soil vapor extraction system in the **vadose zone**. In general, air emerging from the sparge point creates a conical-shaped zone of aeration that expands above the screen at approximately 45 degrees relative to the casing.

Active Pumping with Filtration using Granular Activated Carbon (GAC)

This remediation technology treats hydrocarbons and volatile contaminants dissolved in water. The approach involves pumping groundwater from an area where contaminant concentrations exceed PRGs, and conveying that water to a filter filled with GAC filter. The charcoal is sieved so that the particle size is uniform. The charcoal removes organic molecules dissolved in the water through adsorption. Periodic regeneration or replacement of the GAC filter is required.

Evaluation of Alternatives

In accordance with the NCP, the alternatives were evaluated using the nine criteria described in CERCLA Section 121(b) and the NCP Section 300.430(f)(5)(I)(see Table 4) . The nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. ADEC has reviewed the plan and agrees that if properly implemented, the preferred remedial alternatives identified in this Proposed Plan will meet state regulatory requirements.

The first two of the nine criteria, protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs), are “threshold” factors. The selected alternative must satisfy both of these criteria. The next five criteria are “primary balancing” criteria, and are used to make comparisons and to identify major trade-offs between remedial alternatives.

The last two criteria are “modifying” criteria and can only be fully evaluated after the public comment period for the Proposed Plan is completed. The state has reviewed this Proposed Plan, which agrees with the state acceptance criteria. The community acceptance will be evaluated after the comment period, and public comments will be addressed in the Record of Decision. The preferred alternatives may change in response to public comment or new information. The results of the evaluation are presented on a site basis in the following sections.

SS003 Surface Soil

For SS003, the preferred surface soil remedial alternative is Bioremediation through in-situ landfarming (Table 6). Bioremediation is considered high for overall protection of human health and the environment in surface soil at SS003 by reducing contaminant concentrations below ADEC cleanup levels. The work would be done in accordance with applicable laws including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations—depending on the chosen alternative. Bioremediation actively attenuates COPC concentrations, and is considered effective in reducing contaminant toxicity, mobility, or volume.

Table 6 SS003 - Summary of Detailed Analysis of Non-CERCLA Selected Remedial Alternatives for Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	◐	○	◐	●	25K [1]
Soil Cover	Pass	Pass	◐	○	●	◐	1.6M
Natural Attenuation	Pass	Pass	●	● [3]	○	●	1.5M [1]
Chemical Oxidation	Pass	Pass	●	●	●	◐	720K [2]
Off-site Disposal through Thermal Desorption	Pass	Pass	●	●	◐	◐	3.6M
Off-site Disposal through Landfilling	Pass	Pass	●	○	◐	◐	2.9M
Bioremediation (in-situ landfarming)	Pass	Pass	●	●	○	◐	525K [2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects combined approach for soil and water.
2 - Cost reflects a 2-year operation period.
3 - Passive treatment mechanisms are utilized.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
M - million

Bioremediation is considered effective in reducing or eliminating contaminant concentrations in both the short and long term; therefore, it was rated medium for long-term effectiveness and permanence. Bioremediation requires mobilizing heavy equipment to and from the site to execute; therefore, this alternative was rated medium for implementability, reflecting the more difficult constraints associated with mobilization.

The other active remedial alternatives, Off-site Disposal through Thermal Desorption, Off-site Disposal through Landfilling, and Chemical Oxidation, rank similarly to Bioremediation for most of the criteria, but are more costly. A Soil Cover would not reduce toxicity, mobility, or volume through treatment and is also more expensive than Bioremediation. ICs and Natural Attenuation do not protect ecological receptors in the short term and, therefore, ranked lower overall than Bioremediation.

SS003 Groundwater

For SS003, the preferred groundwater remedial alternative is ICs with Long-term Monitoring (Table 7). ICs would serve to effectively reduce human and ecological exposure to groundwater at SS003 by preventing future development of the groundwater resources in the area; therefore, it is rated high for overall protection of human health and the environment. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations—depending on the chosen alternative.

ICs were rated high for compliance with chemical-specific applicable requirements. ICs were rated high for long-term effectiveness and permanence by preventing future development of resource; ICs would not directly affect contaminant toxicity, mobility, or volume and are rated low for this criterion. For short-term effectiveness, ICs were rated high by reducing human exposure. Long-term Monitoring would be conducted to ensure that the ICs remain effective by tracking contaminant concentrations in the groundwater to make sure that they remain within the area controlled by the ICs. ICs with Long-term Monitoring requires that a small sampling crew with minimal equipment mobilize to the site periodically; therefore, this alternative was rated high for implementability.

The other alternatives considered, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration, do not increase the protectiveness of human health and the environment over ICs, but do provide better short-term effectiveness. However, they are more difficult to implement and not as cost-effective as ICs.

Table 7 SS003 - Summary of Detailed Analysis of Non-CERCLA Selected Remedial Alternatives for Groundwater

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	●	○	●	●	25K[1]
Natural Attenuation	Pass	Pass	●	◐[3]	○	●	1.5M[1]
Enhanced Bioremediation	Pass	Pass	●	●	◐	◐	468K
Active Pumping with Air Stripping	Pass	Pass	◐	◐	◐	◐	835K[2]
Active Pumping with Filtration using GAC	Pass	Pass	◐	●	◐	◐	719K

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects combined approach for soil and water.
2 - Cost reflects a 5-year operation period.
3 - Passive treatment mechanisms are utilized.
GAC - granular activated carbon
K - thousand
M - million

SS008 Surface Soil

The contaminants identified in surface soil at SS008 consist of petroleum hydrocarbons (PHCs) and associated compounds, as well as PCBs and PCE at one sampling location. Given the very different nature of the two types of COPCs, separate detailed analysis of the PHC and PCB/PCE remedial technologies was performed. In keeping with that approach, separate evaluation of alternative for PHCs and PCBs/PCE are presented below.

Lower Camp
Looking from Vicinity of SS008

SS008 PHCs in Surface Soil

For SS008, the preferred surface soil remedial alternative for PHCs is Bioremediation through in-situ landfarming (Table 8). Bioremediation is considered high for overall protection of human health and the environment by reducing COPC concentrations, to below ADEC cleanup levels. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations— depending on the chosen alternative. Bioremediation actively attenuates contaminant concentrations, and is considered effective in reducing or eliminating contaminant concentrations in the long term; therefore, it was rated high for long-term effectiveness and permanence. Bioremediation is also effective in reducing contaminant toxicity, mobility, or volume. Bioremediation is effective in reducing or eliminating contaminant concentrations in the short term. Bioremediation requires mobilizing heavy equipment to and from the site to execute; therefore, this alternative was rated medium for implementability, reflecting the more difficult constraints associated with mobilization.

The other active remedial alternatives, Off-site Disposal through Thermal Desorption, Off-site Disposal through Landfilling, and Chemical Oxidation, rank similarly to Bioremediation for most of the criteria, but are more costly. A Soil Cover would not reduce toxicity, mobility, or volume through treatment and is also more expensive than Bioremediation. ICs and Natural Attenuation do not protect ecological receptors in the short term and, therefore, ranked lower overall than Bioremediation.

Table 8 SS008 - Summary of Detailed Analysis of Non-CERCLA Selected Remedial Alternatives for Petroleum Hydrocarbons in Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Fail	Fail	◐	○	◐	●	75K
Soil Cover	Pass	Pass	●	◐	●	●	1.3M
Natural Attenuation	Pass	Pass	●	●[3]	○	●	1.4M[1]
Chemical Oxidation	Pass	Pass	●	●	●	◐	685K[2]
Off-site Disposal through Thermal Desorption	Pass	Pass	●	●	◐	◐	3.1M
Off-site Disposal through Landfilling	Pass	Pass	●	○	◐	◐	2.6M
Bioremediation (in-situ landfarming)	Pass	Pass	●	●	○	◐	540K[2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects a 20-year monitoring period.
2 - Cost reflects a 2-year operation period.
3 - Passive treatment mechanisms are utilized.
K - thousand
M - million

SS008 PCBs and PCE in Surface Soil

Given the limited amount of soil impacted by PCBs and PCE at SS008, the preferred surface soil remedial alternative is Excavation with Off-site Landfilling at a TSCA Facility (Table 9). Excavation is considered high for overall protection of human health and the environment by eliminating PCB and PCE concentrations at SS008. Off-site Disposal removes PCBs and PCE from the site and was ranked high for compliance with ARARs. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75 and transportation regulations—depending on the chosen alternative.

Excavation with Off-site Landfilling would effectively remove PCBs and PCE from the site; therefore, this alternative was rated high for long-term effectiveness and permanence. Excavation would not effectively reduce the toxicity, mobility, and volume of PCB and PCE-contaminated soil at SS008 through treatment and was, therefore, ranked low.

Excavation with Off-site Landfilling would effectively remove PCB and PCE-contaminated soil in the short-term, but involves potential risk to site workers due to exposure to PCB-contaminated soil during transportation; therefore, this alternative was ranked medium. Implementability is strongly affected by the remote location of Tatalina LRRS; excavation requires mobilizing heavy equipment to and from the site. However, the small volume of PCB and PCE-contaminated soil would require minimal equipment to execute the removal; therefore, this alternative was ranked high for implementability.

The other alternatives evaluated for PCB and PCE impacted soil, ICs and soil cover, would not remove the contaminants from the site. PCBs are extremely stable compounds and persist in the environment for very long periods of time. ICs alone would not protect environmental receptors from exposure, and the Soil Cover would need to be maintained indefinitely. Therefore, removal was determined to be the preferable alternative.

Table 9 SS008 - Summary of Detailed Analysis of CERCLA Selected Remedial Alternatives for PCBs and PCE in Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Fail	Fail	◐	○	◐	●	5K
Soil Cover	Pass	Pass	◐	○	●	●	100K
Off-site Disposal through Landfilling 1	Pass	Pass	●	○	◐	●	250K

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Detailed analysis of alternatives assumes a total of 25 cubic yards of PCB-contaminated soil.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
PCB - polychlorinated biphenyl
PCE - tetrachloroethene

SS008 Groundwater

For SS008, the preferred groundwater remedial alternative is ICs with Long-term Monitoring. ICs would serve to effectively reduce human exposure to groundwater by preventing future development of the groundwater resource in the area; therefore, it is rated high for overall protection of human health and the environment. The work would be done in accordance with applicable laws including monitoring and sampling requirements in 18 AAC 75 and clean water or transportation regulations—depending on the chosen alternative.

ICs were rated high for compliance with chemical-specific applicable requirements.

ICs were rated high for long-term effectiveness and permanence by preventing future development of the groundwater resource. ICs would not directly affect COPC toxicity, mobility, or volume and are rated low for this criterion.

For short-term effectiveness, ICs were rated high by reducing human exposure. Long-term Monitoring would be conducted to ensure that the ICs remain effective by tracking contaminant concentrations in the groundwater to make sure that they remain within the area controlled by the ICs. ICs with Long-term Monitoring requires that a small sampling crew with minimal equipment mobilize to the site periodically; therefore, ICs was rated high for implementability.

The other alternatives considered, Enhanced Bioremediation, Active Pumping with Air Stripping, and Active Pumping with GAC Filtration, do not increase the protectiveness of human health and the environment over ICs, but do provide better short-term effectiveness. However, they are more difficult to implement and less cost effective.

Table 10
SS008 - Summary of Detailed Analysis of CERCLA Selected Remedial Alternatives for Groundwater

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	●	○	●	●	25K [1]
Natural Attenuation	Pass	Pass	●	◐ [3]	○	●	1.5M [1]
Enhanced Bioremediation	Pass	Pass	●	●	◐	◐	301K [2]
Active Pumping with Air Stripping	Pass	Pass	◐	◐	◐	◐	1.5M [2]
Active Pumping with Filtration using GAC	Pass	Pass	◐	●	◐	◐	718K [2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects combined approach for soil and water.
2 - Cost reflects a 5-year operation period.
3 - Passive treatment mechanisms are utilized.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
GAC - granular activated carbon
K - thousand
M - million

SS011 Soil

For SS011, the preferred soil remedial alternatives are Excavation with Off-site Landfilling for exposed debris and areas of stained soil, and ICs for the remainder of the site (Table 11). Excavation with Off-site Landfilling is protective of overall human health and the environment by eliminating COPC concentrations in designated areas, while ICs would serve to reduce human and ecological exposure to the remaining soil. There are no Location-Specific or Action-Specific ARARs applicable to the remedial alternatives evaluated for SS011. Excavation with Off-site Landfilling removes COPCs from the site. ICs do not address chemical-specific ARARs as well as other alternatives. ICs would prevent exposure to subsurface soil in the attainment area, but may not be effective in preventing ecological receptor exposure.

Excavation with Off-site Landfilling is considered effective in eliminating surface soil COPC concentrations in the long-term and was, therefore, rated high for long-term effectiveness and permanence. A medium rating was assigned to ICs for long-term effectiveness and permanence. Off-site Landfilling of excavated material is not considered effective in reducing COPC toxicity, mobility, or volume, while ICs are considered ineffective for this criteria.

Excavation with Off-site Landfilling was rated medium for short-term effectiveness due to complications

associated with handling contaminated soil during transport. ICs also received a medium rating for short-term effectiveness. Implementability is strongly affected by the remote location of Tatalina LRRS. ICs require little or no site work and is among the easiest alternative to implement. Excavation with Off-site Disposal through Landfilling requires mobilization of heavy equipment to and from SS011, as well as larger field crews to execute. Excavation was assigned a medium rating for implementability, reflecting the more difficult constraints associated with mobilizing heavy equipment and extra field personnel.

The other remedial alternatives, Natural Attenuation, Chemical Oxidation, Off-site Disposal through Thermal Desorption, and Bioremediation, rank high for protection of human health and environment; compliance with ARARs; and long-term effectiveness, reduction of toxicity, mobility, or volume through treatment. Natural Attenuation does not protect ecological receptors in the short term and was not selected as the preferred alternative for this reason. Given the low volume of stained soil and the difficult site access, and highly organic soil (interferes with contaminant oxidation), Chemical Oxidation was not selected as the preferred alternative. Bioremediation is similar in implementability and cost as Off-site disposal but is not effective in the short term and therefore was not selected. Off-site Thermal Desorption ranks the same as Off-site Landfilling on six of the criteria but has a higher cost.

Table 11 SS011 - Summary of Detailed Analysis of CERCLA Selected Remedial Alternatives for Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action	Fail	Fail	○	○	○	●	0
Institutional Controls	Pass	Pass	◐	○	◐	●	25K
Natural Attenuation	Pass	Pass	●	●[4]	○	●	1.4M[1]
Chemical Oxidation	Pass	Pass	●	●	●	◐	178K[2]
Off-site Disposal through Thermal Desorption	Pass	Pass	●	●	◐	◐	629K[2]
Off-site Disposal through Landfilling	Pass	Pass	●	○	◐	◐	560K[2]
Bioremediation (Biopile)	Pass	Pass	●	●	○	◐	426K[2,3]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technologyis worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects a 20-year monitoring period.
2 - Cost does not include constructing an access road.
3 - Reflects a 5-year operational period.
4 - Passive treatment mechanisms are utilized.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
M - million

LF004

The preferred remedial alternative for LF004 is ICs with Long-term Monitoring (including cover inspections). The landfill is currently capped with a soil cover to prevent human and ecological exposure to the landfill waste and to reduce precipitation infiltration and leaching. However, the landfill is not lined; therefore, ICs alone do not meet the Long-term Effectiveness criteria, because a potential leachate problem would go undetected.

ICs to prevent disturbance of the landfill wastes and Long-term Monitoring, consisting of cover inspections to ensure its integrity and downgradient groundwater and surface water sampling to detect possible contaminant migration, meet all of the criteria except reduction of toxicity, mobility, or volume through treatment. Due to the volume of waste involved and the remoteness of the site, removing the waste would be exceedingly expensive. ICs also rank only moderate on short-term effectiveness and implementability due to potential exposure risks during excavation and transportation. The Removal alternative is not the preferred alternative

since ICs with Long-term Monitoring meets the threshold criteria, is better in short-term effectiveness and implementability, and can be accomplished at substantially lower cost. The work would be done in accordance with applicable laws, including monitoring and sampling requirements in 18 AAC 75, siting requirements in 18 AAC 60, and transportation regulations—depending on the chosen alternative.

Table 12 LF004 - Summary of Detailed Analysis of Non-CECRLA Selected Remedial Alternatives for Soil

Remedial Alternative	Protection of Human Health and Environment	Compliance with Applicable Requirements	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility or Volume through Treatment	Short-Term Effectiveness	Implementability	Cost ($)
No Action		Fail	Fail	○	○	●	0
Institutional Controls Only		Fail	Fail	○	◐	◐	100K [1]
Long Term Monitoring and Institutional Controls		Pass	Pass	○	●	●	200K [2]
Removal		Pass	Pass	○	◐	◐	50M [2]

Scoring:
- ● Indicates the remediation technology is better than average.
- ◐ Indicates the remediation technology is average.
- ○ Indicates the remediation technology is worse than average.

Note:
Highlighted row indicates preferred alternative.

Key:
1 - Cost reflects a 2-year operation period.
2 - Cost reflects a 5-year operation period.
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
K - thousand
M - million

Preferred Alternative

The primary indicator of remedial action performance would be protecting human health and the environment. The successful implementation of the preferred alternative would achieve a protective and legally compliant remedy.

The preferred remedial alternative for SS003 is Bioremediation through in-situ landfarming for surface soil (down to 2 feet bgs) and preventing exposure to subsurface contaminants (below 2 feet bgs) at the site with ICs, including long-term groundwater monitoring. Contaminated soil would be treated until remaining PHC concentrations are below the site-specific PRGs. A detailed delineation will be done at the remedial design and implementation stage for the isolated occurrence of DRO downgradient of SS003. Groundwater monitoring would be conducted to track contaminant concentrations over time. Petroleum is the only contaminant of concern at SS003, which is not included in CERCLA's definition of hazardous substances and, therefore, further action is not required under CERCLA. The remedy will be implemented consistent with State regulations.

The preferred remedial alternative for SS008 includes: excavation of soil containing PCBs and PCE and off-site disposal at a TSCA landfill facility, bioremediation through in-situ landfarming for surface soil (down to 2 feet bgs), long-term groundwater monitoring, and preventing exposure to subsurface contamination (below 2 feet bgs) at the site with ICs. The petroleum contamination at this site is not subject to CERCLA reporting, response, or liability requirements. PCB-contaminated soil would be excavated until remaining concentrations are below the site-specific PRG of 1 mg/Kg. PCE-contaminated soil


Entrance to LF004

View of Upper Camp Dome

would be excavated until remaining concentrations are below the site-specific PRG of 0.024 mg/Kg. The amount of soil contaminated with PCBs and PCE is estimated at 25 cubic yards although this amount may vary. The excavated material would be placed into drums or supersacks for transport off-site. Removal of the contaminated soil would be confirmed by sampling. Clean fill (soil) from a local source would be used to backfill the excavated area. Since PCBs and PCE would be removed down to concentrations below the most stringent ADEC cleanup level, no soil cover or ICs would be required. The other alternatives were not selected as the preferred remedial action because they would not be as effective and permanent for the long term as excavation with off-site disposal. In addition, a new well will be installed near the sediment sample that contained PCE. The well will be monitored in conjunction with the planned monitoring event for PHC and lead contaminants. PCB and PCE contaminated soil is subject to the 8-step CERCLA procedure described in Figure 2.

PHC contaminants in surface soil and sediments at SS008 would be destroyed using bioremediation. This treatment is expected to reduce contaminant concentrations to below the site specific PRGs in the surface soil. ICs would be implemented to prevent exposure to contaminants in subsurface soil and groundwater. A detailed delineation will be done at the remedial design and implementation stage for the occurrence of free product in Monitoring Well BH37/MW.

The preferred remedial alternative for SS011 includes: removal of exposed debris, excavation of stained soils and sediments to be disposed of at an off-site landfill, and ICs for the entire site to prevent exposure to subsurface contaminants. The other alternatives were not selected as the preferred remedial action because they would either not reduce toxicity as effectively as excavation with off-site disposal, or the alternative would incur significant costs due to construction of an access road. Excavation with Off-site Landfilling would serve to reduce the associated risk for this site. No significant ecological risk would remain once contamination levels are below their respective PRGs for human health.

Additional Information

Additional information can be found in the Administrative Record located at Elmendorf Air Force Base, Alaska, and online at www.adminrec.com. The list of source material is provided for readers who want more detailed information than is presented in this Proposed Plan.

The preferred remedial alternative for LF004 is ICs, including biennial cover evaluations, followed by a 5-year inspection and long-term groundwater and surface water monitoring. Detections of pesticides (DDD, DDE, and DDT) are considered widespread, as these chemicals are representative of remaining residue from historical pesticide use throughout Tatalina LRRS, and are not considered for further remediation. No analytes included in CERCLA's definition of hazardous substances have been detected at this site; however, LF004 is subject to State of Alaska reporting, response, or liability requirements.

These alternatives are preferred because they provide cost-effective protection of human health and the environment. In addition to the above remedial actions, the Air Force would implement, monitor, maintain, and enforce the proposed ICs identified below in accordance with CERCLA and the NCP. The 611th Civil Engineer Squadron would be the point of contact for ICs. To restrict current and future access or exposure to soil and groundwater at these four ERP Sites, the following proposed ICs would be implemented:

- The Tatalina LRRS comprehensive map and Base Master Plan would be updated to show the boundaries of each site to restrict excavation of soil and disturbance of soil covers, as well as to prevent access to groundwater. The Base Master Plan would contain a map indicating site location, with restrictions on any invasive activities that could potentially expose potential contaminants. Dig permits issued by the Base Operating Contractor are required for any excavation at Tatalina LRRS. Excavation, disturbance, or relocation of contaminated soil and groundwater; and excavation or drilling in areas of groundwater contamination, will be restricted by the ICs. Relocation of petroleum-contaminated soil will require prior ADEC approval. Use or removal of petroleum-contaminated groundwater will require characterization and be managed by the applicable regulations. Prior to approving a permit, the Tatalina LRRS comprehensive map and Base Master Plan would be reviewed to ensure that invasive activities are not taking place within the boundary of the sites where land use has been restricted. A Notice of Environmental Contamination will be placed on State (Department of Natural Resources) land records.

- The ICs will be documented in the Air Force Real Property Records, Tatalina LRRS General Plan, and 611th IRP Records. This will include: information about current land uses and allowed uses (prohibiting future residential land use), geographic boundaries of the ICs, an inspection of the site and submittal of a performance report on ICs to ADEC at least once every 5 years after the date of the signed decision document, submittal of a long-term monitoring sampling plan and subsequent sampling reports to ADEC for approval prior to removal of ICs.

- Long-term monitoring and IC management of soil and groundwater conditions will be discontinued once the PRGs for petroleum have been met for two consecutive sampling events. ICs will remain in effect until it is demonstrated the site(s) are suitable for unrestricted use/unlimited exposure per ADEC concurrence.

- The Air Force would notify ADEC prior to making any major changes to the Base Master Plan that could affect the ICs.

- The Air Force would obtain prior concurrence from ADEC to terminate the ICs, modify current land use, or allow anticipated actions that might disrupt the protectiveness of the ICs. In the unlikely event that the property is to be transferred, the Air Force would notify ADEC prior to any transfer taking

General Vicinity View

place and would ensure any ICs are incorporated into the land transfer documents.

- 5-year reviews would be conducted to evaluate the effectiveness of the remedies.

In addition to the above ICs, the following proposed activities would be conducted:

- A land survey would be conducted at ERP Sites SS003, SS008, SS011, and LF004 to identify site boundaries. This information would be used to update land records and the Tatalina LRRS comprehensive map and Base Master Plan. Any activity that is inconsistent with IC requirements, objectives, or controls, or any action that might interfere with protectiveness of the ICs, would be addressed by the Air Force as soon as practicable after discovery. In no instance would ADEC be notified later than 10 days after the Air Force becomes aware of a deficiency.

- The ICs at each site would extend indefinitely, to ensure that human and ecological receptors are protected from potential exposures. Periodic reports of IC monitoring would be prepared at a frequency of at least once every 5 years and provided to ADEC with copies filed in the Administrative Record.

The proposed remedies outlined above are considered to best meet the site cleanup objectives and the NCP evaluation criteria. In addition, if a selected alternative allows contamination to remain above levels allowing unrestricted use of a site, reviews of the selected alternative would be conducted as long as required by applicable law. The reviews are intended to be an evaluation of site conditions, to determine if the alternative remains protective or if a modification to the selected alternative is warranted.

Selective Administrative Record References:

Additional information can be obtained from the Administrative Record located at Joint Base Elmendorf-Richardson (JBER) in Anchorage, Alaska. The Administrative Record for Tatalina LRRS includes detailed investigation reports, evaluation of potential cleanup technologies, and test results from field studies. Electronic copies of the documents contained in the Administrative Record can also be viewed online at www.adminrec.com. The Administrative Record contains the documents listed below.

USAF. 1998b. Tatalina LRRS Remedial Investigation Report. Final. October.

USAF. 2000. Results of 1999 Tatalina LRRS Follow-on Remedial Investigation of Source Area SS-008/WAA No. 4. Technical Memorandum. May 22, 2000.

USAF. 2000. Results of 1999 Tatalina LRRS Follow-On Remedial Investigation and Closure Evaluation of Source Area LF004 Technical Memorandum. February 25, 2000.

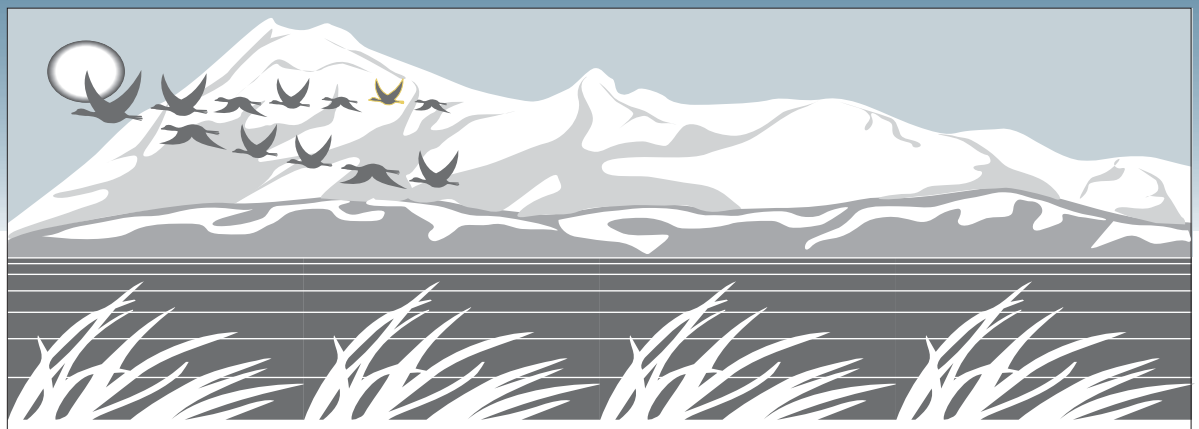
USAF. 2004. 2003 Final Follow-On Remedial Investigation at SS003, SS008, and SS011 Report. Tatalina LRRS, Alaska. January.

USAF. 2005. 2004 Final Follow-On Remedial Investigation at SS003, SS008, and SS011 Report. Tatalina LRRS, Alaska. August.

USAF. 2008. Tatalina LRRS, Follow-On Remedial Investigation at SS003, SS008, and SS011. Technical Memorandum. Draft. February.

USAF. 2009. Human Health and Ecological Risk Assesssments at SS003, SS008, and SS011. Report. Final. August.

USAF. 2009. Tatalina LRRS. Focused Feasibility Study at SS003, SS008, and SS011. Report. Final. November.



COMMUNITY PARTICIPATION
HOW YOU CAN PARTICIPATE

You are encouraged to comment on this Proposed Plan. The public comment period begins on May 7, 2012, and ends on June 6, 2012.

If there is sufficient interest for a public meeting on this Proposed Plan, and a meeting is requested before the end of the 30-day comment period, an acceptable meeting date will be scheduled before June 20, 2012, and the comment period extended.

Contact for Questions

If you have any questions about the information provided in this Proposed Plan,

You can mail or email your comments to the USAF Community Involvement Coordinator at the following address:

Mr. Tommie Baker
611 CES/CEAR
10471 20th Street, Suite 340
JBER, Alaska 99506-2201
1-907-552-4506, or
Toll Free: 1-800-222-4137
e-mail: tommie.baker@us.af.mil

APPENDIX C

Response to Comments

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
1.	1-1	1.2	**Statement of Basis and Purpose** The text states that the Air Force and Environmental Protection Agency (EPA) have jointly selected the remedy for each site. However, in the very next paragraph, it states that EPA has been given the opportunity to review this document and has chosen to defer to the ADEC for regulatory oversight of the ERP at Tatalina Long Range Radar Station (LRRS). This last sentence gives the reader the impression that the EPA has not selected any remedy. Please correct text to reflect EPA's involvement in this document. Please clarify whether or not EPA has been actively involved in the selection of any of the remedies. Also, ADEC requests the Air Force delete the sentence: "The Alaska Department of Environmental Conservation (ADEC) concurs with the selected remedy." The text states: "As the lead agency, the Air Force has selected the remedy. ADEC concurs with the selected remedy." ADEC requests the sentence be changed to the following: "ADEC agrees that the selected remedies, when properly implemented, comply with state law."	*Agree. This section has been clarified. The third paragraph in this section has been removed.* *Agree. This sentence has been deleted.* *Agree. This text has been modified as suggested.*
2.	1-1	1.3.1	**Assessment Under CERCLA** The text states: "…land use controls (LUCs) that limit the use and/or exposure…" However, in Section 1.4.1 and elsewhere in the document the Air Force refers to Institutional Controls (ICs) in the text and tables. Please choose one or the other and be consistent throughout the document.	*Agree. The text has been modified to use ICs throughout the document.*
3.	1-2 & 1-3	1.4.1	**Remedies Selected Under CERCLA** 1st bullet ADEC requests the Air Force change the text as follows: "The Base Master Plan would contain a map indicating site location, with restrictions on any invasive activities that could potentially *result in* exposure contaminants." The text states: "Excavation, disturbance, or relocation of contaminated soil and groundwater, and excavation or drilling in areas of groundwater contamination, will be restricted by the ICs." ADEC requests the Air Force ensure other sections of the Record of Decision (ROD) define the restrictions (e.g. prohibit intrusive work). ADEC will also require text stating ADEC and Air Force approval of a work plan on how	*Agree. The text has been modified as suggested.* *Text was added that states "The Air Force will follow the Draft LUC Management*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			potentially contaminated material will be managed prior to issuing a dig permit. 2nd paragraph ADEC requests the Air Force change the first sentence to the following: "At ERP Site SS008, an estimated 25 cubic yards of PCB and PCE contaminated soil will be *excavated and* disposed *of* off-site in drums or Super Sacks®[1]." ADEC requests the Air Force include in the first bullet, after the second sentence, the following text: "As part of the update to the Base Master Plan, the USAF will produce maps showing locations of residual contamination, and will provide these maps to ADEC." ADEC requests clarification on why ERP Site SS011 is a site under CERCLA since exposed debris, stained soil and sediments appear to the reader to be better managed under State of Alaska regulatory authority for DRO, PAHs and RRO contaminants. There is one contaminant: Alpha-BHC which maximum concentration was detected (2.0 mg/kg) above Table B1 migration to groundwater cleanup level of 0.0064 mg/kg and above the 1.2 mg/kg direct contact value for the Under 40-Inch Zone (see Table 2-5 for SS011 page 2-47). Page 1-3 The text states: "To restrict current and future access or exposure to soil and groundwater at these two ERP Sites, the following proposed ICs will be implemented:…" Please add a bullet: Notice of Environmental Contamination will be placed in the Alaska Department of Natural Resources' land records. Last sentence appears to be missing text. ADEC requests the following be added: "A Notice of Environmental Contamination will be placed on the State (Alaska Department of Natural Resources) land records." 3rd bullet	*Plan to receive ADEC approval for site activities."* *Agree. The text has been modified as suggested.* *Agree. The text has been modified as suggested.* *SS011 remains a CERCLA site due to chlorinated pesticides endrin, endrin aldehyde, and endrin ketone.* *This information is included in the bullet for Location and Notice of Environmental Contamination.*

[1] Super Sack is a Registered Trademark of B.A.G. Corp.

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			ADEC requests the Air Force change the text to state it will conduct annual inspections and submit the performance reports to ADEC, every year, for the first five years followed by a five-year review. At that time, the frequency of inspections and reports may be reduced.	*Agree. This text has been added.*
4.	1-4	1.4.2	**Remedies Selected Under State of Alaska Regulations** General Comment ADEC requests the Air Force elaborate on why 20 years was picked for the length of long-term monitoring and inspections (e.g. the time frame was what was used in the Feasibility Study for the detailed analysis of total costs or this is the amount of time estimated to achieve cleanup levels in groundwater). "Past USEPA guidance recommended the general use of a 30-year period of analysis for estimating present value costs of remedial alternatives during the FS (USEPA 1988). While this may be appropriate in some circumstances, and is a commonly made simplifying assumption, the blanket use of a 30-year period of analysis is not recommended. *Site-specific justification* should be provided for the period of analysis selected, especially when the project duration (i.e., time required for design, construction, O&M, and closeout) exceeds the selected period of analysis. The period of present value analysis should not necessarily be limited to the commonly-used assumption of 30 years. Explanation should be provided whenever the period of analysis is less than the estimated project duration." (Guide to Developing and Documenting Cost Estimates During the Feasibility Study, July 2000, EPA 540-R-00-002 OSWER 9355.0-75) SS008 ADEC requests the Air Force add text to the section where SS008 is discussed to mirror the discussion in SS003 for groundwater monitoring. 1st bullet The text states: "Prior to approving a permit, the Tatalina LRRS comprehensive map and Base Master Plan would be reviewed to ensure that invasive activities are not taking place within the boundary of the sites where land use has been restricted."	*Agree. Text has been added to indicate that 20 years was used in the FS and is not the estimated time to achieve cleanup levels.* *Disagree. The groundwater monitoring for SS008 is addressed under the CERCLA remedies in section 1.4.1.* *Text was added that states "The Air Force will follow the Draft LUC Management*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			ADEC requests the Air Force include provisions for approving work in such areas as long as ADEC and the AF review and approve the plans. 2nd bullet The text states: "…an inspection of the site and submittal of a performance report on ICs to ADEC at least once every 5 years after the date of the signed decision document…" ADEC requests the Air Force change the text to state it will conduct annual inspections and submit the performance reports to ADEC, every year, for the first five years followed by a five-year review. At that time, the frequency of inspections and reports may be reduced.	*Plane to receive ADEC approval for site activities."* *Agree. This text has been added.*
5.	1-5	1.5.1	**CERCLA** The text states: "The selected remedies for ERP Sites SS008 and SS011 satisfy the statutory preference for treatment as a principal element of the remedy, because the contamination will be removed from Tatalina LRRS and disposed of at a permitted Toxic Substances Control Act (TSCA) facility." ADEC disagrees. The removal of contamination from Tatalina LRRS and subsequent disposal at a TSCA facility is not "treatment" unless there is "treatment" occurring at the facility. Landfilling is not considered a treatment technology. *Treatment technology* means any unit operation or series of unit operations that alters the composition of a hazardous substance or pollutant or contaminant through chemical, biological, or physical means so as to reduce toxicity, mobility, or volume of the contaminated materials being treated. Treatment technologies are an alternative to land disposal of hazardous wastes without treatment (40 CFR §300.5 Definitions). ERP Site SS008 Add text to the end of the last sentence as follows: "…the environment *and every five years thereafter until cleanup levels are met.*"	*Agree. Text has been modified to indicate that these remedies do not satisfy the statutory preference for treatment.* *Agree. The text has been modified as suggested.*
6.	1-6	1.5.2	**Remedies Required Under State of Alaska Regulations** 1st Paragraph: change the sentence to read: "The selected remedies for ERP Sites SS003, SS008, SS011, and LF004 are protective of human health and the environment and, comply with promulgated requirements." Delete the 2nd paragraph that begins with: "The selected remedy represents…"	*Agree. The text has been modified as suggested.* *Agree. The text*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			ending with "…state and community acceptance." <u>3rd Paragraph</u> Add text to the end of the last sentence as follows: "…the environment *and every five years thereafter until cleanup levels are met.*"	*has been modified as suggested.* *Agree. The text has been modified as suggested.*
7.	1-7	1.7	**Authorizing Signatures** ADEC request the following changes be made to this section: "This signature sheet documents the United States Air Force's approval of the remedy selected in this Record of Decision for ERP Sites SS003, SS008, SS011 and LF004 at Tatalina LRRS, Alaska. It also indicates ADEC's agreement that the selected remedies, when properly implemented, comply with state law."	*Agree. The text has been modified as suggested.*
8.	2-30	2.5.7.2	**ERP Site SS003** For all of these sections that discuss contaminant concentration ranges, ADEC suggests the Air Force also refer to the cleanup levels so that the reader can compare the amount detected to the cleanup level.	*Agree. The text has been modified as suggested.*
9.	2-30	2.5.7.3	**EPR Site SS008** The text discusses PCB soil contamination and PCE sediment contamination, but does not give specific contaminant concentrations. ADEC requests the Air Force list the range (where applicable) detected or the contaminant level and the cleanup levels so the reader can compare the amount detected to the cleanup level.	*Agree. The text has been modified as suggested.*
10	2-30	2.5.7.4	**ERP Site SS011** ADEC requests the Air Force clarify why this site is under CERLCA since the text in this section does not give justification to the reader why it would be addressed under CERCLA.	*Please see response to Comment #3.*
11	2-30	2.5.7.5	**ERP Site LF004** The text states: "One soil boring was drilled and converted to a monitoring well, and then sampled for subsurface soil and groundwater." ADEC requests the Air Force state what was found in the soil and groundwater during this sampling event. The text states: "Breakdown products were detected from pesticides legally applied throughout the installation at levels below ADEC Method Two soil cleanup levels and, therefore, are not considered for remediation."	*Agree. The text was modified as suggested. The following sentence was added: "Benzene, BTEX, and pesticides were detected below*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			It is ADEC's understanding that this exception requires a two-part test: (1) was the pesticide at issue registered under FIFRA and (2) did the contamination, "result … from the application of a pesticide product?" ADEC requests the Air Force provide additional evidence supporting this statement.	*ADEC cleanup levels in the soil boring and groundwater."* *Pesticides have been added to site LF004 as a CERCLA contaminant of concern within the ROD document.*
12	2-45	New section	Immediately after **2.6.1 Land Use** section, ADEC requests the Air Force include a new section called: "**Property Transfer**" Include the following text for this new section as follows: The USAF will provide notice to the EPA and ADEC, consistent with CERCLA Section 120(h), at least six (6) months prior to any transfer or sale of USAF property associated with Tatalina LRRS, including transfers to private, state or local entities, so that the EPA and ADEC can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective land use controls. If it is not possible for the USAF to notify the EPA and ADEC at least six (6) months prior to any transfer or sale, then the USAF will notify the EPA and ADEC as soon as possible but no later than sixty (60) days prior to the transfer or sale of any property subject to land use controls. In addition to the land transfer notice and discussion provisions above, the USAF further agrees to provide the EPA and ADEC with similar notice, within the same time frames, as for federal to-federal transfer of property accountability and administrative control to ADEC. Review and comment opportunities afforded to the EPA and ADEC as to federal-to-federal transfers shall be in accordance with all applicable federal laws. All notice and comment provisions above shall also apply to leases, in addition to land transfers or sales.	*Agree. The text has been added as requested.*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
13	2-32	2.6.1	**Land Use** The text states: "Residual soil contamination is not safe for recreational and/or residential use." ADEC requests the Air Force delete the phrase: "is not safe" and insert "exceeds risk-based cleanup levels" for recreational and/or residential use." ADEC requests the Air Force verify whether residual soil contamination exceeds risk-based cleanup levels for recreational use, if not then delete from text in this section. <u>Page 2-45</u> <u>1st bullet</u> ADEC requests the Air Force change the text in this section to read as follows: "Groundwater at SS003 and SS008, does not meet cleanup levels protective of drinking water use. Accordingly, the base must impose LUCs to ensure the groundwater is not used for potable purposes until it is remediated to applicable cleanup levels." ADEC comment to Air Force: some cleanup levels in Table C are based on maximum contaminant levels and some are not.	*Agree. The text has been modified as suggested.*
14	2-70	2.8	**Remedial Action Objectives** All of these RAO's are too general. They need specificity – the exposure route, the contaminant and the level to which you will prevent exposure.	*The RAOs have been rewritten to be more specific about the exposure route, contaminant, and cleanup level. Please see section 2.8 for revised text.*
15	2-71	2.9	**Description of Alternatives** The text: "The remedial alternatives considered for ERP Sites SS003, SS008, and SS011 were presented in the FS Report (USAF, 2009b) and the remedial alternatives considered for ERP Site LF004 were presented in the Proposed Plan…" is confusing to the reader. ADEC requests the Air Force clarify whether all the alternatives presented in the Proposed Plan or just for LF004.	*Agree. The text has been clarified.*
16	2-72	Table 2-13	**Summary of Remedial Alternatives Evaluated for ERP Sites SS003, SS008, SS011 and LF004**	*Agree. The suggested ARARs*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			General Comment Section 2.10.2 is a discussion of ARARs. The text for the sites says that there are no location-specific or action-specific ARARs associated with these alternatives. ADEC will list the ARARs as it sees applicable for each of the alternatives. They Air Force needs to correct the text of Section 2.10.2 with the appropriate ARAR. <u>SS003 and SS008 Surface Soil – Petroleum Hydrocarbons</u> <u>Alternative Description</u> Institutional Controls : Action specific – 18 AAC 75.375 Soil Cover: Action specific: Action specific - 18 AAC 75.320-.380 Natural Attenuation: Action specific - 18 AAC 75.320-.380 Chemical Oxidation: Action specific - 18 AAC 75.320-.380 Off-site Disposal through Thermal Treatment: Assuming this is excavation and disposal offsite – Action specific – 18 AAC 70 (if there are waterbodies or wetlands in the area), 18 AAC 60 and 18 AAC 63. 18 AAC 75.320-.380 Off-site Disposal through Excavation and Off-site Landfilling: Action specific – 18 AAC 70 (if there are waterbodies or wetlands in the area), 18 AAC 60 and 18 AAC 60, 18 AAC 75.320-.380 Bioremediation (in-situ landfarming): Action specific - 18 AAC 75.320-.380 <u>SS003 and SS008 Groundwater</u> <u>Alternative Description</u> Enhanced Bioremediation: Action specific -18 AAC 75.320-.380 Active Pumping with Air Stripping: Action specific -18 AAC 75.320-.380 Active Pumping with Granular Activated Carbon Filtration: Action specific -18 AAC 75.320-.380 <u>LF004 Soil and Groundwater</u>	*have been incorporated into the text.*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			Alternative Description Institutional Controls with Long-Term Monitoring: Action specific -18 AAC 75.320-.380. Also, the text needs to be either LUCs or ICs in this section and throughout the document.	
17	2-73 & 2-74	2.9	**Description of Alternatives** **Natural Attenuation** The text states: "A key component of this approach is to consider and monitor multiple processes, as well as track the individual processes, in order to estimate the overall rate and extent of attenuation." The text for this alternative should also state it will have LUCs or ICs (whichever term the Air Force chooses to use throughout the document). **Thermal Treatment** The alternative as it is listed on the previous page says "off-site disposal through thermal treatment". ADEC requests clarification on whether soil is being thermally treated on site and shipped off-site or being excavated and then sent off-site for thermal treatment at a permitted facility. **Excavation and Off-site Landfilling** ADEC requests the Air Force to change text in last sentence for this alternative to read: "CERCLA hazardous substances will be landfilled at a facility permitted to accept *such* wastes." **Active Pumping with Air Stripping** ADEC requests the Air Force clarify on which alternative is being presented with air sparging versus pump and treat with air stripping. To the reader it appears the Air Force is mixing the two alternatives.	*Agree. The text has been modified as suggested.* *Agree. The text has been modified as suggested.* *Agree. The text has been modified as suggested.* *Agree. The text has been modified as suggested.*
18	2-78	2.10.2.1	**ERP Site SS003 Surface Soil** See comment #16 above regarding location-specific, action specific applicable requirements for the remedial alternatives for SS003.	*Agree. The text has been modified as suggested.*
19	2-79	2.10.2.4	**ERP Site SS008 – CERCLA Hazardous Substances** ADEC requests the Air Force clarify whether this heading should say "in soil". If so, then correct in sections below.	*Agree. The text has been modified as*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
				suggested.
20	2-82	2.10.4.1	**Reduction of Toxicity, Mobility, or Volume Through Treatment** **ERP Site SS003 – Surface Soil** Neither off-site disposal through landfilling nor soil cover is considered "treatment".	*Agree. The text has been modified as suggested.*
21	2-83	2.10.4.3	**ERP Site SS008 – Surface Soil PHCs** See comment #18 above regarding "treatment" and off-site disposal through landfilling and soil cover.	*Agree. The text has been modified as suggested.*
22	2-83	2.10.4.4	**ERP Site SS008 – CERCLA Hazardous Substances** See comment #18 above regarding "treatment" and soil cover.	*Agree. The text has been modified as suggested.*
23	2-83	2.10.4.6	**ERP Site SS011 – Surface Soil** See comment #18 above regarding "treatment" and off-site disposal through landfilling.	*Agree. The text has been modified as suggested.*
24	2-84	2.10.4.7	**ERP Site LF004** ADEC requests the Air Force add text to the sentence as follows: "None of the alternatives considered for soil at LF004 are considered effective in reducing COC TMV through treatment."	*Agree. The text has been modified as suggested.*
25	2-91 & 2-92	2.12	**Selected Remedies** All bullets: The Air Force should state these remedial actions were based on the nine criteria for all remedies at SS003, SS008, SS011 and LF004. For example: "The remedy will achieve overall protection of human health and the environment and comply with ARARs. The remedy provides the best balance among the balancing criteria and appears consistent with comments received from the public and the ADEC. The remedy is easily implemented, is cost effective and is both a short and long-term solution for contamination at the site."	*Agree. The text has been modified as suggested.*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
			Page 2-92 ADEC requests the Air Force change the text in the first paragraph to read: "LUCs will remain in effect for as long as *residual contaminants at the site preclude unrestricted use and unlimited exposure*." Delete remaining text beginning with: "…~~site conditions pose an unacceptable~~…"	
26	2-93	2.12.2	**Description of Selected Remedies** ADEC requests the Air Force delete the reference to "site-specific" and change the text as follows: "PCB-contaminated soil would be excavated until remaining concentrations are below the cleanup level of 1 mg/Kg. The PCE-contaminated soil would be excavated until remaining concentrations are below the cleanup level of 0.024 mg/Kg." The text states: "The exposed debris will also be removed for off-site disposal." ADEC requests the Air Force clarify whether the exposed debris will be disposed of at Tatalina in a permitted landfill or elsewhere (i.e. off-site). ADEC requests clarification and further elaboration regarding the statement: "Source materials constituting principal threats exist at Site SS008." As it reads now, the reader is left wondering what "source materials" are being referenced. Perhaps it would be better stated that the principal threat wastes at SS008 is soil contaminated with PCB and TCE at SS008. The NCP establishes the USEPA's expectation that treatment will be used to address the "principal threats" posed by a site wherever practical (40 CFR §300.430(a)(1)(iii)(A)). The "principal threat" concept refers to the source materials at a Superfund site that are highly mobile and cannot be reliably controlled in place, or present a significant risk to human health or the environment should exposure occur. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater or air or that acts as a source for direct exposure.	*Agree. The text has been modified as suggested.* *The following text has been added:* *"Solid waste will be disposed in a permitted landfill at Tatalina LRRS, while contaminated waste will be disposed off-site from Tatalina LRRS."* *Agree. The text has been modified as suggested.*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
27	2-94	2.12.2	**Description of Selected Remedies** ADEC requests the Air Force add text as follows to the following: "to ensure that invasive activities are not taking place within the boundary of the sites where land use has been restricted, *or that ADEC and Air Force approvals are obtained prior to conducting such work*." ADEC requests the Air Force add a bullet stating: "A Notice of Environmental Contamination will be placed on State (Alaska Department of Natural Resources) land records." This would be in lieu of combining it with other text in this section. The text states: "an inspection of the site and submittal of a performance report on ICs to ADEC at least once every 5 years…" ADEC requests the Air Force state instead that it will conduct annual inspections and submit the performance reports to ADEC, every year, for the first five years followed by a five-year review. At that time, the frequency of inspections and reports may be reduced. <u>2nd Bullet</u> ADEC requests the Air Force delete the reference to PHCs and change the text to read as follows: "Long-term monitoring and IC management of soil and groundwater conditions will be discontinued once the cleanup levels have been met for two consecutive sampling events." <u>Last bullet</u> The text states: "Periodic reports of IC monitoring would be prepared at a frequency of at least once every 5 years and provided to ADEC, with copies filed in the Administrative Record." ADEC requests the Air Force state instead: "that it will conduct annual inspections and submit the performance reports to ADEC, every year, for the first five years followed by a five-year review. At that time, the frequency of inspections and reports may be reduced."	*The IC text has been significantly modified and this text is no longer included. Please review new IC text.* *This text is in a bullet titled "Location and Notice of Environmental Contamination"* *Agree. The text has been modified as suggested.* *Agree. The text has been modified as suggested.* *Agree. The text has been modified as*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
				suggested.
28	2-96	2.12.4	**Expected Outcomes of Selected Remedies** ADEC requests the Air Force change the text to read as follows: "No *known* contamination above ADEC Method Two soil cleanup levels identified in 18 AAC 75, Table B1, for under 40-inch zone, and ADEC Table C groundwater cleanup levels will remain at LF004, *however, it is a former landfill and an operating landfill overlays the majority of the site*. Contamination above ADEC Method Two soil and ADEC Table C groundwater cleanup levels will remain onsite at SS003, SS008, and SS011. Refer to Tables 2-3, 2-4, and 2-5 for COCs and concentrations. However, the selected remedies, *which include* ICs, will limit human exposure to contaminants at these sites and promote the safety of human health and the environment.	*Agree. The text has been modified as suggested.*
29	2-96	2.13.1	**Protection of Human Health and the Environment** ADEC requests the Air Force change the text to read as follows: Excavation of CERCLA hazardous materials at SS008 and SS011would serve to protect human health and the environment by *reducing* COC concentrations from the designated attainment areas at Tatalina LRRS and relocating to an off-site, permitted facility. Change "sites pecific" to "site specific".	*Agree. The text has been modified as suggested.* *Agree. The text has been modified as suggested.*
30	2-101	Table 2-22	**Description of ARARs and TBCs** ADEC requests the Air Force add in the ARARs listed in the description of alternatives above (Comment #17). Action to be Taken to Attain Requirement text states: "The selected remedies will comply with these regulations through the use of ICs and five-year reviews." The text listed in the table is a generic answer that does not apply to all the remedies selected. ADEC requests the Air Force to either split it out or don't use in the table. Location-specific, Endangered Species Act, Action to be taken to Attain Requirement: the text states the selected remedies won't impact endangered/threatened species in the area. However, in the text of the document, it is stated there are none present (2.5.5.3).	*Agree. Text has been added to incorporate the ARARs listed in Comment #17.* *Agree. This text has been removed.* *Agree. The reference to the Endangered Species Act will be removed from the ARAR/TBC table.*

Cmt. No.	Pg. & Line	Sec.	Comment/Recommendation	Response
31	2-103	2.13.4	**Utilization of Permanent Solutions and Alternative Treatment Technologies** 2nd Sentence: please add the word onsite to sentence: "Although no *onsite* treatment is being utilized for CERCLA hazardous …"	*Agree. The text has been modified as suggested.*
32	2-103	2.13.5	**Preference for Treatment as a Principal Element** The text is not a sentence: "The selected remedy of Bioremediation Through In-situ Landfarming at for PHCs at SS003 and SS008 satisfies the statutory preference for treatment as a principal element of the remedy." Delete the word "at" in the text to read as follows: "The selected remedy of Bioremediation Through In-situ Landfarming for PHCs at SS003 and SS008 satisfies the statutory preference for treatment as a principal element of the remedy."	*Agree. The text has been modified as suggested.*