UNITED STATES AIR FORCE
LAKE LOUISE RECREATION CAMP, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SUPPLEMENTAL FEASIBILITY STUDY REPORT FOR THREE CERCLA CONTAMINANTS

611 CES

PRIDE IN PROGRESS

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JANUARY 2012

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LIST OF ACRONYMS AND ABBREVIATIONS

%	Percent
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AES	Ahtna Engineering Services, LLC
ARARs	Applicable or Relevant and Appropriate Requirements
BaP	benzo(a)pyrene
Bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
ERP	Environmental Restoration Program
FS	Feasibility Study
HCG	Hoefler Consulting Group
IC	Institutional Control
LLRC	Lake Louise Recreation Camp
mg/Kg	Milligram(s) per Kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operations and Maintenance
PCB	Polychlorinated Biphenyl
PID	Photoionization Detecter
PPE	Personal Protective Equipment
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
SLR	SLR International Corp
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
yd^3	Cubic Yards

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1.0 INTRODUCTION

The purpose of this Supplemental Feasibility Study (FS) is to identify, evaluate, and select the preferred remedial action alternative for soil at the Lake Louise Recreation Camp (LLRC) with contaminants of concern (COCs) that are Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances. The three CERCLA COCs are polychlorinated biphenyls (PCBs), lead, and benzo(a)pyrene (BaP). These contaminants were detected at concentrations above Alaska Department of Environmental Conservation (ADEC) Method Two soil cleanup levels for the Under 40-Inch Zone during demolition and debris removal activities (Ahtna Engineering Services, LLC [AES] 2011) at LLRC in the fall of 2010. This FS is a supplement to the previous FS reports for LLRC (Hoefler Consulting Group [HCG] 2010 and SLR International Corp [SLR]/AES 2011). These COCs were not included in previous FS reports.

This Supplemental FS was written under the U.S. Air Force (USAF) Environmental Restoration Program (ERP) for LLRC, Alaska. The ERP is consistent with CERCLA, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It is designed to identify, quantify, and remedy problems associated with past management, disposal, and spills of hazardous substances at USAF facilities.

1.1 Site Background

The LLRC is located in the Copper River Valley, bound to the north by the foothills of the Alaska Range, the east by the Wrangell Mountains, the south by the Chugach Mountains, and the west by the Talkeetna Mountains. The LLRC is 173 miles northeast of Anchorage and 16 miles north of the Glenn Highway at milepost 157, at an elevation of 2,362 feet. The LLRC is adjacent to the community of Lake Louise with a current estimated population of 91. The Lake Louise area is a designated State Recreation Area and is popular for boating, fishing, and snowmobiling. Figure 1-1 shows the regional vicinity of the LLRC.

The USAF acquired approximately 25 acres that comprises the LLRC via Public Land Order 1509 from the United States Bureau of Land Management. The USAF has no further use for the property and intends to relinquish it once cleanup is complete. The State of Alaska has applied (top-filed) to receive the property following relinquishment. There is currently no schedule for the property transfer.

The USAF discontinued use of the LLRC in 1965 after the March 1964 earthquake due to extensive damage to property. In 1971, buildings at the site were demolished or relocated leaving only the concrete foundations.

Figure 1-2 shows key features at the LLRC. Additional detailed information regarding facility history and use, land and water use, and environmental setting has been included in previous FS reports (HCG 2010 and SLR/AES 2011). The three COCs discussed in this report are located at different locations at the LLRC as discussed in the next sections.

1.1.1 PCBs at Power Plant Area

The Power Plant Area contained three diesel-powered generators, which provided electrical power to the LLRC. The generators were located on a concrete slab enclosed in a building. Figure 1-2 shows the location of the Power Plant Area relative to other features at the LLRC. Figure 1-3 is a map of the Power Plant.

In 2009, seven soil samples were collected from the surface soil surrounding the edge of the concrete slab. Three samples contained detectable PCBs. However, no samples contained PCBs greater than the ADEC cleanup level of 1 milligram/kilogram (mg/Kg). The highest concentration was 0.3 mg/Kg, detected in a sample near the north corner of the slab (HCG 2010).

In October 2010, the concrete slab was removed as part of the Clean Sweep Program and sections that were impacted by PCBs greater than 1 mg/Kg were segregated (AES 2011). The non-impacted concrete was buried at the gravel pit. The PCB impacted concrete will be shipped offsite for disposal in 2012. Following removal of the slab, six additional soil samples were collected from the surface soil surrounding the former slab. Two of those samples contained PCBs greater than 1 mg/Kg, with a maximum detection of 1.9 mg/Kg (AES 2011). Both samples with PCBs greater than 1 mg/Kg were detected near the north corner of the former slab. The volume of soil containing PCBs greater than 1 mg/Kg remaining at the Power Plant Area was estimated to be approximately 1 cubic yard (yd^3) (Figure 1-3).

PCB amended paint was used as a fire retardant in the 1950s and 1960s; it has been found on many USAF facilities constructed in Alaska during that period. The surface of the concrete slab at the Power Plant showed paint in some areas at the time of removal, although most paint was weathered and barely visible. Paint was most noticeable on the north corner of the slab. Therefore, it was suspected that the PCBs detected in the soil are due to PCB amended paint flaking off the slab.

1.1.2 Lead at the Lodge Area

The Lodge Area is located near the northeast corner of the LLRC property. The building itself was removed in 1971 and only the concrete building slab remained. The septic system for the lodge was located down slope of the slab to the northeast (Figure 1-4). It consisted of two steel underground storage tanks (USTs), named the upper and lower USTs. It was initially thought that the upper UST was a wooden crib during the 2009 investigation (HCG 2010).

The lodge concrete slab and both USTs and their contents, including sewage sludge, were removed in the fall of 2010 as part of the Clean Sweep Program (AES 2011). Soil staining, stressed vegetation, and unusual odors were not observed during the removal. After removal of the USTs, confirmation soil samples were collected from the floor and sidewalls of the excavations. Samples from the lower UST were below the ADEC cleanup levels except for arsenic, which was attributed to natural conditions. At the upper UST, a sidewall soil sample 3 feet below ground surface (bgs), collected from the presumed inlet to the UST, contained lead at 3,720 mg/Kg. A second extraction of the soil confirmed the elevated lead concentration with a result of 1,530 mg/Kg (AES 2011). The Method Two Under 40-Inch Zone cleanup level for lead is 400 mg/Kg. An estimated one yd^3 of lead-contaminated soil above this cleanup level is present in this area.

The source of the lead at this location is unknown. Potential sources could be lead containing materials discharged through the septic system at the lodge, leaching from piping, or flaking lead based paint from tanks.

1.1.3 BaP at the Dining Hall Area

The Dining Hall Area is located in the northern portion of the LLRC and consisted of the dining hall building and a septic/sewage leach field northwest of the building (Figure 1-5). The leach field was located down slope of the former dining hall and contained what is interpreted as being two septic system pits or leach fields: one constructed of wood cribbing (identified as the upper pit) and another constructed of 55-gallon metal drums (identified as the lower pit). It is unknown whether these septic system pits/leach fields were part of the same system or if one system replaced the other (HCG 2010).

No contaminants were identified in the leach fields during the 2009 investigation (HCG 2010). The dining hall concrete slab, wood cribbing, metal drums, and associated debris were removed in the fall of 2010 (AES 2011). No staining or stressed vegetation was noted in the leach field during removal. Confirmation soil samples were collected from the lower pit following excavation. A sample from the approximate center of the floor of the lower pit at a depth of 5 feet bgs contained BaP at a concentration of 0.6 mg/Kg, which is above the ADEC Method Two cleanup level of 0.49 mg/Kg. The estimated volume of soil containing BaP above 0.49 mg/Kg in this area is estimated at less than one yd^3. The BaP was attributed to residual sewage sludge (AES 2011).

1.1.4 BaP at the Shower Area

The Shower Area is located on the northern part of the LLRC property and consisted of a shower building, two USTs down slope, a wood crib, and associated piping. Based on historical drawings, the USTs were likely part of a septic system for the shower building. Figure 1-5 shows the location of the structures.

Samples collected from the USTs in 2009 indicated the sludge in the upper UST contained some polycyclic aromatic hydrocarbons above ADEC Method Two cleanup levels. The USTs, their contents, and associated debris were removed in 2010 (AES 2011). Photoionization detector (PID) headspace samples from the sludge in the upper UST were collected every 6 inches during removal and all were below 10 parts per million. PID headspace samples were also collected from the lower UST and the wood crib excavation sidewalls and floor, with no elevated results. Confirmation soil samples were collected from the upper UST, lower UST, and wood crib areas after removal. Two of the three confirmation samples collected from the upper UST, both at one foot bgs, contained BaP above the Method Two cleanup level of 0.49 mg/Kg. The maximum concentration was 1.3 mg/Kg (AES 2011). An estimated one yd^3 of soil remains at the upper UST that contains BaP above the cleanup level. The BaP was attributed to residual sewage from the removed UST.

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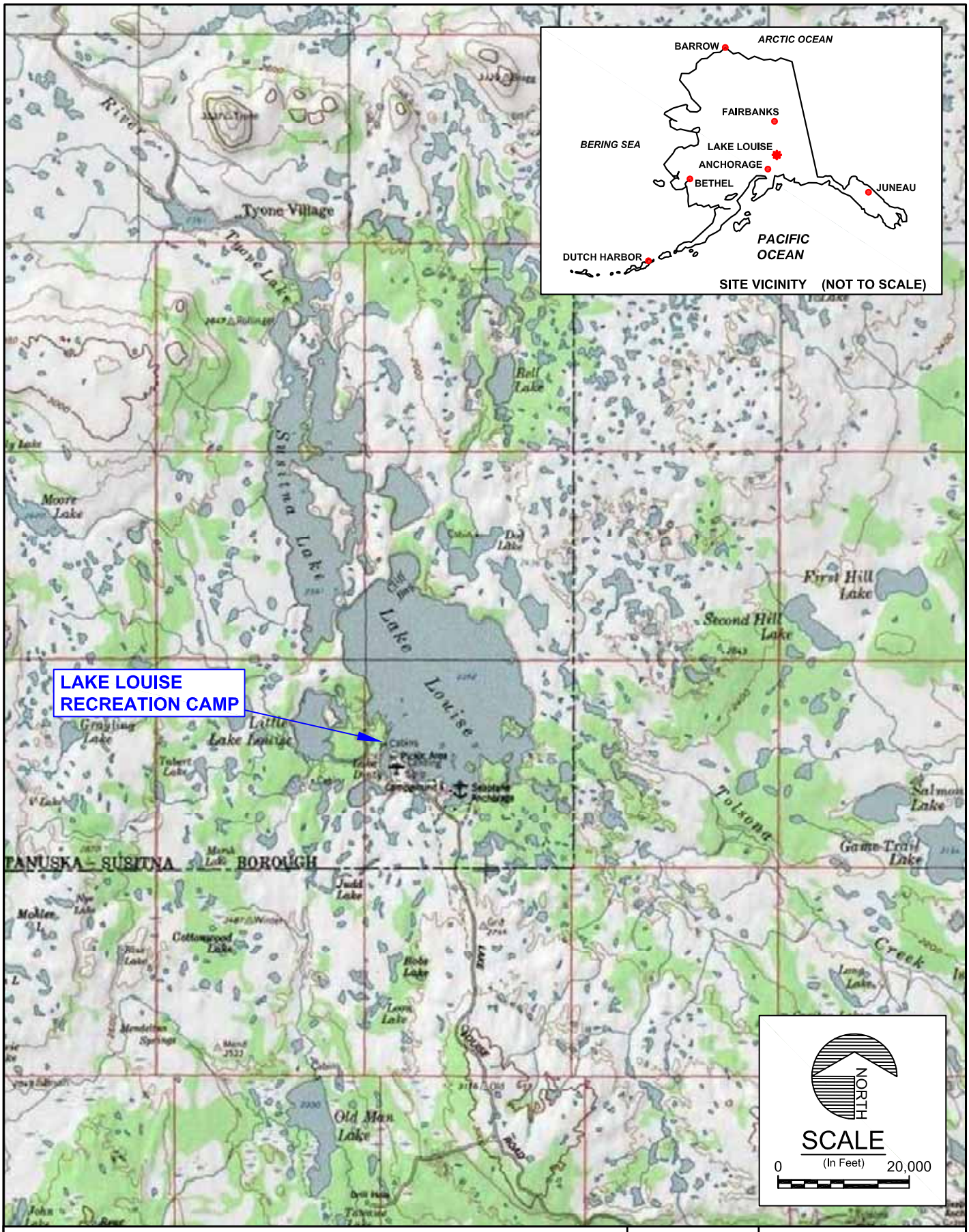

Lake Louise Recreation Camp
Regional Vicinity Map

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LAKE LOUISE RECREATION CAMP, ALASKA

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PROJECT NO:	105.00569.00080
DATE:	11–22–2011
SHEET SIZE:	8.5x11
FIGURE:	1–1

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APPROXIMATE INSTALLATION BOUNDARY

DRUM & DEBRIS AREA

WETLANDS (SWAMP)

DINING HALL LEACH FIELD AREA

LOWER

UPPER

DINING HALL

LOWER TANK

SHOWER AREA USTs

UPPER TANK

LODGE AREA USTs

LOWER TANK

UPPER TANK

SHOWER

PUMPHOUSE

LODGE

THERMOKARSTED AREA

STEEL SINK (ABOVE GROUND)

ANTENNA BASE

TRAIL

TRAIL

PICNIC AREA CAN DUMPS

FLAG POLE STAND & CAN DUMP

TO OTHER GRAVEL PIT

GRAVEL PIT AREA

POWER PLANT AREA

BURIED DRUM

TANK TRAILERS AREA

GENERATOR SHED & BOAT SHOP AREA

WETLANDS (SWAMP)

GRAVEL ROAD

BOROUGH ROAD

TO LAKE LOUISE ROAD

NEAREST PRIVATE RESIDENCE (SEASONAL)

LAKE LOUISE

LAKE DINTY

KEY

- 2009/2010 INVESTIGATED AREAS
- 2009 INVESTIGATED AREAS
- CONCRETE SLAB
- LAKE SHORELINE
- WETLANDS
- INSTALLATION BOUNDARY

FEATURES AND SCALE APPROXIMATE

NORTH

SCALE (In Feet) 0 150

Lake Louise Recreation Camp Primary Features

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LAKE LOUISE RECREATION CAMP, ALASKA

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PROJECT NO:	105.00569.00080
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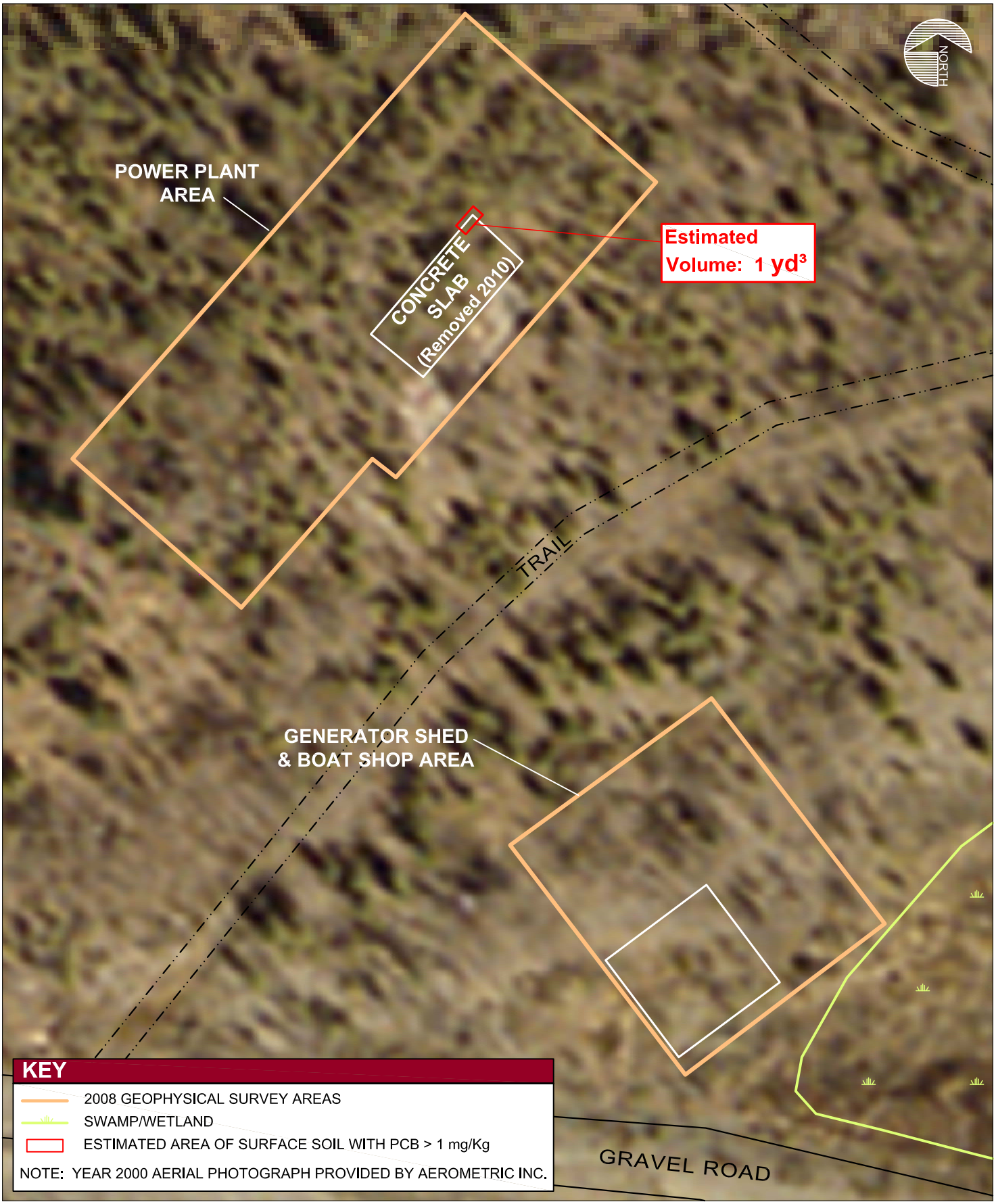

SCALE
0 (In Feet) 30

Power Plant Area
Estimated Extent of PCB-Contaminated Soil

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SCALE
(In Feet)
0 30

Lodge Area Estimated Extent of Lead-Contaminated Soil

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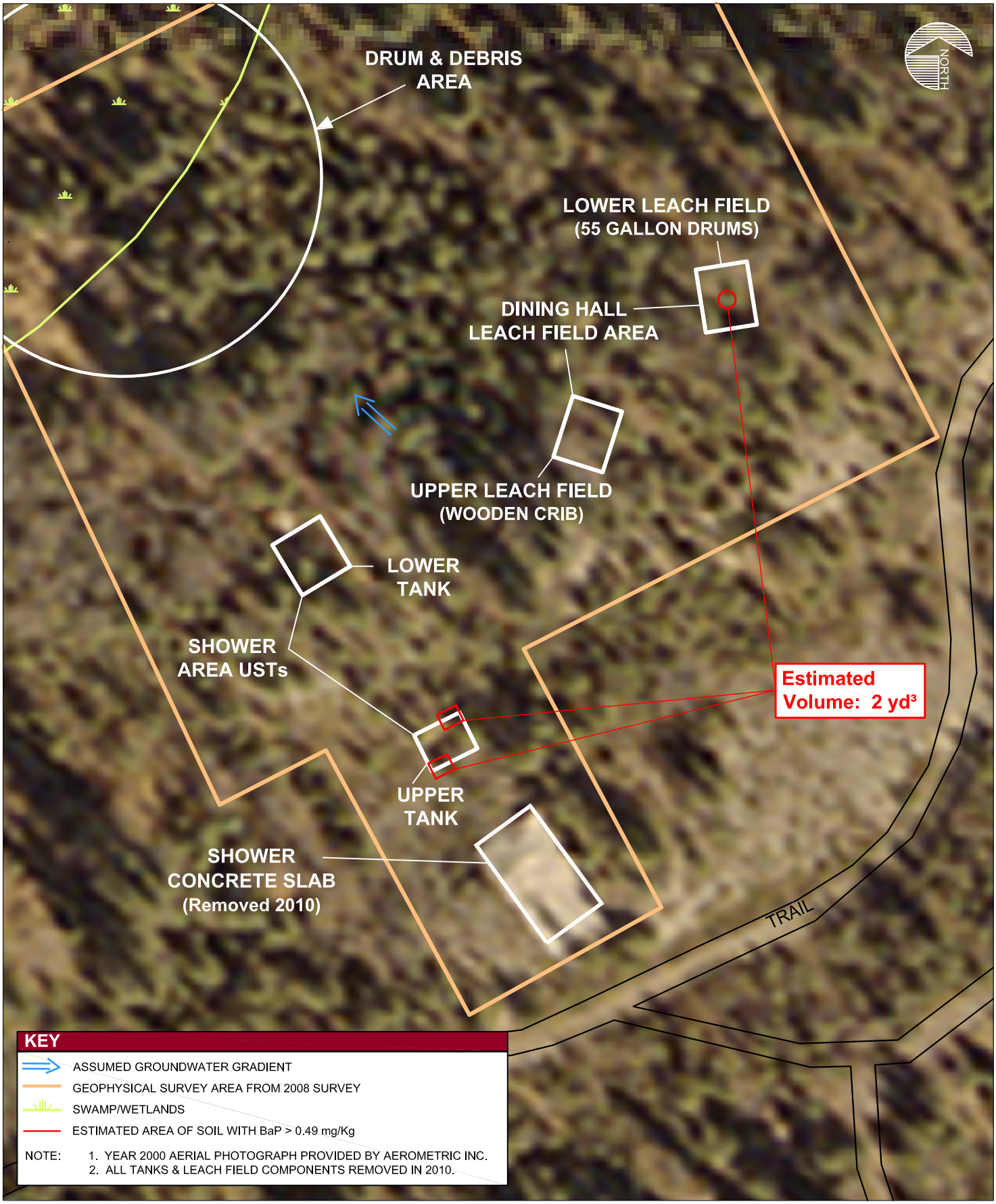

SCALE
0 (In Feet) 30

Dining Hall Leach Field & Shower UST Areas Estimated Extent of BaP-Contaminated Soil

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2.0 FEASIBILITY STUDY BACKGROUND AND METHODS

2.1 Approach To Study

The purpose of this FS is to identify and evaluate remedial alternatives and select a preferred remedial action for the contaminated soil with the three CERCLA COCs at the LLRC.

This section describes further background information and the methods used during the FS.

2.2 Remedial Action Requirements

The Remedial Action Objectives (RAOs) for the LLRC are to:

1. Protect human health and the environment;
2. Comply with applicable Federal, State and local laws and regulations;
3. Implement remedies that are consistent with the USAF's limited presence at the LLRC and the long-term goal of transferring the property to another party, to the extent practical given the relative costs and benefits; and
4. Obtain a designation of "cleanup complete," with or without institutional controls (ICs), under 18 Alaska Administrative Code (AAC) 75.

The first step is to screen the potential alternatives using three primary criteria: effectiveness, implementability, and cost (Section 3.0). The alternatives judged as the best or most promising on the basis of these evaluation factors are then retained for a detailed evaluation (Section 4.0) using nine criteria as outlined under CERCLA guidance (U.S. Environmental Protection Agency [USEPA] 1988). A no action alternative is included in the evaluation. The no action alternative provides a baseline comparison; it is included from the initial screening to the detailed analysis of alternative, as required by the NCP. After the detailed evaluation, a preferred remedy is selected (Section 5.0).

The nine CERCLA evaluation criteria (USEPA 1988) are described below:

1. **Protection of human health and the environment:** How well does the alternative as a whole protect the health and safety of humans, animals, and plants?
2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs):** Does the alternative meet all state and federal laws? If a waiver is required, how is it justified? This assessment also addresses other information advisories, criteria, and guidance that the lead and support agencies have agreed are "to be considered." A list of ARARs is included in Appendix A.
3. **Long-term effectiveness and permanence:** What is the long-term risk at the site after the remedial action is complete? Are the contaminants permanently removed or destroyed?
4. **Toxicity, mobility, or volume reduction through treatment:** How well does the treatment reduce toxicity, mobility, or volume of the contaminants?
5. **Short-term effectiveness:** Could human, animal, or plant health and safety be impacted during construction and implementation of the alternative?

6. **Implementability:** Is the alternative available and able to be constructed, maintained and/or enforced? What is the technical and administrative feasibility of this alternative and availability of the required goods and services?
7. **Cost:** Is the alternative cost-effective in terms of both capital and operation and maintenance (O&M) costs?
8. **State agency acceptance:** What are the State's (or support agencies') comments or concerns about the alternatives considered and about the preferred alternatives? Does the State support the preferred alternative?
9. **Community acceptance:** What are the community's comments or concerns about the alternatives considered and about the preferred alternatives? Does the community support the preferred alternative?

At this stage, the community has not performed a formal review of the Supplemental FS; therefore, their level of acceptance is not known and these criteria were not included in the evaluation.

2.3 Cost Estimating Procedures

Cost estimates for the alternatives evaluated are provided in Appendix B. Cost estimates were developed for viable alternatives on a consistent basis that included labor rates, waste disposal costs, and material pricing. Pricing for activities was based on the assumption that other project work would be conducted at the LLRC in conjunction with remedial action of soils. Therefore, no mobilization costs were calculated for equipment, operators, or laborers. All costs were adjusted as needed based on professional judgment to account for uncertainties and future cost escalation. It was assumed work would occur in 2012.

The cost estimates provided in this Supplemental FS are an estimate of the level of effort required to perform a given alternative given the services available today and the assumed waste quantities and categories. They are considered accurate to the USEPA-recommended standard of plus 50 percent (%) to minus 30% (USEPA 1988). The pricing is valid for comparative purposes but is not intended for final budget development or programming.

2.4 Contaminants of Concern and Cleanup Levels

The CERCLA COCs in the soil are BaP, lead, and PCBs. The ADEC cleanup levels for these compounds and the estimated total volume of each are shown in Table 2-1.

Table 2-1 CERCLA Contaminants of Concern and Cleanup Levels at LLRC

Compound	Cleanup Level (mg/Kg)	Estimated Excavated Volume (yd^3)	Location (Area)
BaP	0.49	2	Dining Hall, Shower Area
Lead	400	1	Lodge Area USTs
PCBs	1	1	Power Plant Area

The cleanup levels are the ADEC Method Two cleanup levels for the Under 40-Inch Zone under 18 AAC 75.341 (Table B1) (ADEC 2008). These cleanup levels are protective of human health under a residential exposure scenario, without restrictions or controls. All three of these COCs are relatively persistent in the environment, and considered bioaccumulative compounds of

potential concern by ADEC (ADEC 2010). In addition, they tend to bind to soils and do not leach from the soil to groundwater (USEPA 2011a, b, and c). These three COCs are not likely to naturally degrade in place. Therefore, natural attenuation is not a remedial option. Due to the similar properties of the COCs, including their estimated volumes, the potential remedial alternatives and subsequent evaluations are nearly identical.

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3.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

3.1 PCB-Contaminated Soil

This section introduces appropriate screening technology options for addressing the PCB-contaminated soil at the Power Plant Area. The RAOs discussed in Section 2.2 were considered in identifying the selected alternative for the Power Plant Area. Table 3-1 provides an evaluation of the prospective technologies and process options screened for addressing the PCB-contaminated soil. Four potential viable primary alternatives were evaluated against the primary screening criteria (effectiveness, implementability, and cost), as listed below:

1. No Action;
2. ICs;
3. Containment; and
4. Source Removal and Offsite Disposal.

As shown on Table 3-1, alternatives 1, 2 and 4 were selected for further evaluation.

3.2 Lead-Contaminated Soil

This section introduces appropriate screening technology options for addressing the lead-contaminated soil at the Lodge Area USTs. The RAOs discussed in Section 2.2 were considered in identifying the selected alternative for the Lodge Area. Table 3-2 provides an evaluation of the prospective technologies and process options screened for addressing the lead-contaminated soil. Three potential viable primary alternatives were evaluated against the primary screening criteria (effectiveness, implementability, and cost), as listed below:

1. No Action;
2. ICs; and
3. Source Removal and Offsite Disposal.

As shown on Table 3-2, alternatives 1, 2 and 3 were selected for further evaluation.

3.3 BaP -Contaminated Soil

This section introduces appropriate screening technology options for addressing the BaP-contaminated soil at the Dining Hall Leach Field and the Shower Area USTs. The RAOs discussed in Section 2.2 were considered in identifying the selected alternative for this soil. Table 3-3 provides an evaluation of the prospective technologies and process options screened for addressing the BaP-contaminated soil. Three potential viable primary alternatives were evaluated against the primary screening criteria (effectiveness, implementability, and cost), as listed below:

1. No Action;
2. ICs; and
3. Source Removal and Offsite Disposal.

As shown on Table 3-3, alternatives 1, 2 and 3 were selected for further evaluation.

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Table 3-1 Screening of Remedial Alternatives for PCB-Contaminated Soil

General Response Action	Technology	Process Options (Description)	Effectiveness	Implementability	Relative Cost	Evaluation
No Action	None	Do not take response action.	Poor. PCBs are stable compounds and are unlikely to degrade naturally. PCBs will be susceptible to migration, erosion, and dispersion into surface water. The alternative will not prevent potential for PCBs to enter food chain.	Simplest to implement.	Lowest cost.	Retained as required by NCP (baseline comparison).
Land Use (Institutional) Controls	Public education and access restrictions	Control site access to reduce exposure (e.g., erect fencing and post signs) and cap PCB-contaminated soil with gravel. Long term monitoring (simple inspection) and maintenance of controls required. Restriction on future land use required	Does not prevent future release of PCBs if soil erodes (see above). Partial reduction in risks to humans and wildlife, at least initially.	Relatively easy to implement initially. Requires minor construction of cap, fencing, and signage. Restriction on future land use may be hard to maintain indefinitely, especially if USAF desires to transfer property. Long administrative tasks required.	Low capital costs and low O&M costs if cap does not erode, otherwise costs are moderate to high.	Retained for further evaluation.
Containment	Solidification	Solidify the PCB-contaminated soil with a cement grout or other proprietary-like additive using large mechanical mixing equipment. This requires that the contaminated soil be mixed with cement grout, encapsulating the PCBs. The soil will act as aggregate with the cement to make concrete. Requires excavation of contaminated soil. Would most likely require institutional controls (signage or fencing), supplemented with long-term monitoring (e.g., site inspections). Restriction on future land use required	Effective at minimizing contaminant migration, if maintained. Depending on the type of product used, complete encapsulation may not be possible. Does not reduce toxicity or volume of waste.	Uses unconventional technology and construction techniques in Alaska for solidification of soil. Minor permitting required. Restriction on future land use may be hard to maintain indefinitely, especially if USAF desires to transfer property. Long-term administrative tasks required.	Relatively high capital cost. Potentially moderate to high O&M costs.	Rejected. Higher cost than land use controls but with little added benefit. Higher risk than other alternatives due to non-conventional technique.
Source Removal and Offsite Disposal	Offsite Landfilling in Contiguous U.S. (e.g. Oregon)	Excavate the contaminated soil and dispose of in an offsite landfill permitted to accept the waste.	Effective at minimizing exposure by reducing the mobility of the waste. Provides long-term effectiveness (permanent solution). Does not meet statutory preference for treatment but is protective of human health and the environment.	Uses conventional construction methods. Permitted offsite disposal facilities are readily available. Soil would be shipped to a TSDF in the Contiguous U.S. (e.g., Oregon).	High capital cost for offsite disposal. Low O&M costs.	Retained for further evaluation.

Abbreviations
NCP – National Contingency Plan, O&M – operations and maintenance, PCBs – Polychlorinated Biphenyls, TSDF – Treatment, Storage, and Disposal Facility, USAF – United States Air Force

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Table 3-2 Screening of Remedial Alternatives for Lead-Contaminated Soil

General Response Action	Technology	Process Options (Description)	Effectiveness	Implementability	Relative Cost	Evaluation
No Action	None	Do not take response action.	Poor. Lead is a stable compound and unlikely to degrade naturally. Lead will be susceptible to migration, erosion, and dispersion into surface water. The alternative will not prevent potential for lead to enter food chain.	Simplest to implement.	Lowest cost.	Retained as required by NCP (baseline comparison).
Land Use (Institutional) Controls	Public education and access restrictions	Control site access to reduce exposure (e.g., erect fencing and post signs) and cap lead-contaminated soil with gravel. Long term monitoring (simple inspection) and maintenance of controls required.	Does not prevent future release of lead if soil erodes (see above). Partial reduction in risks to humans and wildlife, at least initially.	Relatively easy to implement initially. Requires minor construction of cap, fencing, and signage. Restriction on future land use may be hard to maintain indefinitely, especially if USAF desires to transfer property. Long-term administrative tasks required.	Low capital costs and low O&M costs if cap does not erode, otherwise costs are moderate to high.	Retained for further evaluation.
Source Removal and Offsite Disposal	Offsite Landfilling in Contiguous U.S. (e.g., Oregon)	Excavate the contaminated soil and dispose of in an offsite landfill permitted to accept the waste.	Effective at minimizing exposure by reducing the mobility of the waste. Provides long-term effectiveness (permanent solution). Does not meet statutory preference for treatment but is protective of human health and the environment.	Uses conventional construction methods. Permitted offsite disposal facilities are readily available. Soil would be shipped to a TSDF in the Contiguous U.S. (e.g., Oregon).	High capital cost for offsite disposal. Low O&M costs.	Retained for further evaluation.

Abbreviations

NCP – National Contingency Plan, O&M – operations and maintenance, TSDF – Treatment, Storage, and Disposal Facility, USAF – United States Air Force

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Table 3-3 Screening of Remedial Alternatives for BaP-Contaminated Soil

General Response Action	Technology	Process Options (Description)	Effectiveness	Implementability	Relative Cost	Evaluation
No Action	None	Do not take response action.	Poor. BaP is a stable compound in the subsurface and are unlikely to degrade quickly. It will be susceptible to migration, erosion, and dispersion into surface water and groundwater. The alternative will not prevent potential for dermal absorption or inhalation.	Simplest to implement.	Lowest cost.	Retained as required by NCP (baseline comparison).
Land Use (Institutional) Controls	Public education and access restrictions	Control site access to reduce exposure (e.g., erect fencing and post signs) and cap BaP-contaminated soil with gravel. Long term monitoring and maintenance of controls required.	Does not prevent future release of BaP if soil erodes (see above). Partial reduction in risk to humans and wildlife, at least initially.	Relatively easy to implement initially. Requires minor construction of cap, fencing, and signage. Restriction on future land use may be hard to maintain indefinitely, especially if USAF desires to transfer property. Long-term administrative tasks required.	Low capital costs and low O&M costs if cap does not erode, otherwise costs are moderate to high.	Retained for further evaluation.
Source Removal and Offsite Disposal	Offsite Landfilling	Excavate the contaminated soil and dispose of in an offsite landfill permitted to accept the waste.	Effective at minimizing exposure by reducing the mobility of the waste. Provides long-term effectiveness (permanent solution). Does not meet statutory preference for treatment but is protective of human health and the environment.	Uses conventional construction methods. Permitted offsite disposal facilities are readily available. Soil would be shipped to a landfill in the Contiguous U.S. (e.g., Oregon) unless disposal in Alaska is approved.	High capital cost for offsite disposal. Low O&M costs.	Retained for further evaluation.

Abbreviations
NCP – National Contingency Plan, O&M – operations and maintenance, BaP – benzo(a)pyrene, TSDF – Treatment, Storage, and Disposal Facility, USAF – United States Air Force

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4.0 DEVELOPMENT AND ANALYSIS OF ALTERNATIVES

This section provides a description and assessment of the remedial alternatives that have been identified as favorable based on previous screening (Section 3.0).

In order to compare alternatives, achievement of the threshold criteria (overall protection of human health and the environment, and compliance with ARARs) was ranked on a pass/fail basis. Each alternative was then evaluated based on relative achievement of each of the four balancing criteria, as described in Section 2.2. The purpose was to identify the advantages and disadvantages of each alternative relative to one another so that key trade-offs could be identified. After ranking each criterion, the scores were tallied to determine their total relative ranking.

Table 4-1 provides comparative analyses to evaluate the relative performance of each alternative for the three CERCLA COCs against the CERCLA-specified criteria (as described in Section 2.2). Due to the similarities of the three COCs and alternative evaluated, they are discussed together in the Section 4.1 and 4.2. Appendix B provides cost estimates for the alternatives evaluated, for each CERCLA COC. Table 4-1 presents the costs for all three CERCLA COCs. A summary of these costs is provided in Table 4-2.

4.1 Remedial Action Alternatives

Based on the three screening alternatives carried forward for further consideration from the initial screening process (Section 3.0), three remediation alternatives were developed for addressing soil contaminated with the three CERCLA COCs (PCBs, lead, and BaP). These alternatives are described below.

4.1.1 Alternative 1 – No Action

This alternative assumes that no action would be taken to address remediation of the contaminated soil at the LLRC site. Under this alternative, the contaminated soil would remain in place without any ICs such that current and future risk to human health and the environment would not be reduced.

4.1.2 Alternative 2 – Land Use Controls

Under this alternative, areas with contaminated soil would be capped with 2 feet of gravel, and fencing would be installed around the area. Signs would be posted on the fence to warn site visitors of the presence of the particular type of contaminated soil present. For cost estimating purposes, it was assumed that monitoring and maintenance would be conducted every five years for 30 years. However, the monitoring would probably need to continue indefinitely. The monitoring would consist of documented visual observations of the site conditions and verification the controls are still in place and effective. Maintenance would primarily consist of securing and repairing fencing and signage. If surface water erosion is observed during monitoring, additional maintenance such as the construction of berms could be required. This additional maintenance was not accounted for in the cost estimates.

4.1.3 Alternative 3 – Source Removal and Offsite Disposal

This action would consist of the removal (excavation) of contaminated soil and offsite disposal. Soil will be transported to a Treatment, Storage, and Disposal Facility (TSDF) permitted to

accept the waste. Due to the shipping distance, this alternative would likely use the largest volume of fuel and create the most emissions. The transportation to the TSDF would need to be coordinated and documented as being completed.

All the contaminated soil with CERCLA hazardous substances (PCB, lead, and BaP) will be derived from a CERCLA regulated site. Therefore, offsite disposal must be consistent with the Off-Site Rule (40 Code of Federal Regulations [CFR] 300.440). Section 121(d)(3) of CERCLA applies to any CERCLA response action involving the off-site transfer of any hazardous substance, pollutant, or contaminant (CERCLA wastes). The section requires that CERCLA wastes may only be placed in a facility operating in compliance with Resource Conservation and Recovery Act (RCRA) or other applicable Federal or State requirements. These facilities include, but are not limited to, TSDFs that are regulated under RCRA or the Toxic Substances Control Act (TSCA). The section further prohibits the transfer of CERCLA wastes to a land disposal facility that is releasing contaminants into the environment, and requires that any releases from other waste management units must be controlled. PCB, lead, and BaP-contaminated soil meets the definition of a CERCLA waste (40 CFR 302.4). Therefore, the Off-Site Rule would apply to disposal of the contaminated soil unless a waiver is requested from the USEPA or cleanup actions are performed under a different regulatory authority (non-CERCLA action). Given these conditions and associated requirements, it is assumed that the contaminated soil with CERCLA COCs will be shipped to a TSDF in the Contiguous U.S. The cost estimates assume the soil will be disposed at the Columbia Ridge Landfill in Oregon.

4.1.4 Evaluation Summary

Alternative 1 fails threshold criteria because it fails to protect human health or the environment. Alternatives 2 and 3 pass threshold criteria.

Alternative 2, Land Use Controls, does not provide a permanent solution and allow for the achievement of cleanup complete (without ICs) under 18 AAC 75, which is more consistent with decreasing the USAF's presence at the LLRC. Inspections of the site and maintenance of the ICs would be needed indefinitely because the concentrations of the COCs are unlikely to change except through dispersion. Consequently, the long-term costs for ICs would eventually exceed the costs of a removal action. In addition, it is unlikely another party would want to take responsibility for maintaining the ICs; therefore, the USAF would likely retain management of the property under this Alternative.

Alternative 3, source removal and offsite disposal, provides for protection of human health and the environment, and is a permanent solution. The small volume (estimated 1-2 yd^3) of soil at each location makes a removal action comparatively easy to implement. This alternative has a relatively high initial cost; however, the long-term cost is likely to be less than Alternative 2. Once this action is completed, cleanup would be complete and the USAF would no longer need to administer or maintain the site. If the contaminated soil is disposed in a landfill meeting the requirements of the Off-Site Rule, the contaminants will remain in place without exposure pathways or the potential for migration.

Table 4-1 Detailed Evaluation and Comparison of Alternatives for Addressing three CERCLA COCs (PCBs, lead, and BaP) in Soil at LLRC

Removal and Disposal Criteria	1 No Action	2 Land Use Controls	3 Source Removal & Offsite Disposal in Contiguous U.S. (e.g., Oregon)	Comparative Analysis of Alternatives
1. Overall Protection of Human Health and the Environment	This alternative is not protective of human health and the environment. COCs would remain at levels greater than ADEC Method Two cleanup levels. It does not provide sufficient long-term effectiveness and permanence.	This alternative is protective of human health and the environment and minimizes exposure pathways if maintained.	This alternative is protective of human health and the environment. It provides long-term effectiveness and permanence. There is less long-term liability and risk than the other alternatives. It will eliminate exposure pathways by placing soil in a managed landfill.	Alternative 1 does not sufficiently protect human health and the environment from future risk. It would result in contaminated soil with concentrations greater than the ADEC Method Two cleanup level remaining on site with the potential for future impact to human health or the environment. Alternatives 2 and 3 provide for protection of human health and the environment. Alternative 2 provides protection if the ICs are maintained.
Ranking Score[1]	Fail	Pass	Pass	
2. Compliance with ARARs	Does not comply with all ARARs.	Complies with ARARs.	Complies with ARARs.	Alternative 1 does not comply with ARARs. Alternatives 2 and 3 comply with ARARs, but it may be more difficult for Alternative 2 to comply with ARARs over the long-term compared to Alternative 3.
Ranking Score[1]	Fail	Pass	Pass	
3. Long-term Effectiveness and Permanence	Is not effective. Contaminated soil would remain in place with concentrations greater than applicable cleanup levels with no action to reduce risk to human health or the environment. Potential for erosion of contaminated soil.	Effective, provided the ICs are maintained.	Provides long-term effectiveness and permanence. Soil is placed in a permitted landfill in the Contiguous U.S. (e.g., Oregon).	Alternative 1 does not provide long-term effectiveness and permanence. Alternative 2 provides for long-term effectiveness and permanence provided ICs are maintained. Alternative 2 requires long-term maintenance and monitoring. Alternative 3 is a permanent solution and all three CERCLA COCs above Method Two cleanup levels are removed from the site.
Ranking Score[1]	1	3	5	
4. Reduction of Toxicity, Mobility, and Volume through Treatment	No treatment performed. Does not reduce toxicity, mobility, or volume of waste.	No treatment performed. Does not reduce the toxicity or volume of waste. Site access would be limited through the use of ICs (fencing and signage). Cap would reduce mobility to some degree. Requires maintenance and monitoring.	No treatment performed. No reduction in toxicity or volume, but potential for mobility to decrease with disposal in a controlled location.	None of the alternatives meet the preference for treatment. COCs are unlikely to naturally attenuate. Alternative 1 would not result in a reduction of toxicity, volume, or mobility. Alternative 2 could result in a slight reduction in mobility. Alternative 3 will result in less mobility since the soils are being relocated to a controlled environment.
Ranking Score[1]	1	2	3	
5. Short-term Effectiveness (Impacts)	No short-term risk to workers, community, or environment by this action due to construction. However, workers and visitors could be exposed to contaminated soil without controls to limit access. The action can be completed immediately.	Minimal short-term risk to workers, community or environment by this action due to construction. Exposure will be minimized with appropriate PPE (level C maximum). The action can be completed within one field season.	The short-term risk to workers and the environment is greater than for the other alternatives. This is due to the increased handling of soils involved and the longer transportation distance. This alternative would use the most non-renewable resources (fuel) and generate the most air emissions during soil transport and handling.	Alternative 1 poses no risk while the action is being completed because no site activities would be performed. However, it allows for the short-term risk associated with contaminated soil exposure to remain. Alternative 2 has the best short-term effectiveness. Alternative 2 results in less risk of exposure to site workers and releases to the environment than Alternative 3. This is based on increased shipping distance for Alternative 3, which increases handling and the risk of spills and generates more air emissions.
Ranking Score[1]	2	4	3	
6. Implementability	Easily implemented technically. No construction or operation required. However, no action would be implanted under this option, as required by the National Contingency Plan (NCP)	Uses conventional technology and construction techniques. Relatively easy to implement initially but long-term maintenance could be difficult due to the USAFs limited presence. ICs will likely need to be maintained indefinitely.	Very little permitting/approval required (receiving landfill must agree to accept waste). Infrastructure and resources are already in place to transport to landfill. Requires coordination and management of removal action and shipping to disposal facility.	Alternative 1 is the easiest to technically implement, but no action would be implanted under this option, as required by the National Contingency Plan. Alternative 2 is the easiest action to implement in terms of the logistical and technical requirements, but t would require USAF to maintain management of property, which is not desired. Alternative 3 has the most complicated logistics due to the removal and shipping the soil to the Contiguous U.S. (e.g., Oregon). However, this type of activity is done routinely.
Ranking Score[1]	1	1	4	
7. Cost[2]	Capital: $0 O&M: $0 Total: $0	Installation: $77,815; O&M: $157,740 Total: $235,555 (Costs are for 30 years)	Total: $66,633	Alternative 1 has the lowest cost. Alternative 2 has a higher cost than alternative 3 because the ICs need to be maintained indefinitely. The PCBs are not likely to degrade in place.
Ranking Score[1]	5	2	3	
Overall Ranking Score	**Failed threshold criteria.**	**13**	**18**	

Note:

[1] Ranking scores for criteria 1 and 2 are on a pass/fail basis. Ranking scores for criteria 3 through 7 are on a 1 to 5 scale based on relative achievement of the criteria (1=low achievement; 2=low to moderate achievement; 3=moderate achievement; 4=moderate to high achievement; 5=high achievement).

[2] See Appendix B for details on the cost evaluation.

Abbreviations:

ADEC – Alaska Department of Environmental Conservation
ARARs – Applicable or Relevant and Appropriate Requirements
COC – contaminant of concern
O&M – Operations and Maintenance
PCBs – Polychlorinated Biphenyls
PPE – Personal Protective Equipment
USAF – U.S. Air Force

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Table 4-2 Cost Comparison of Alternatives at LLRC

PCB-contaminated Soil Alternative Description	Unit Price per Ton[1,2]	Estimated Total Cost[1]	Reference
Alternative 1: No Action	$0	$0	N/A
Alternative 2: Land Use Controls (over 30 years)	$46,947	$76,053	Table B-1a
Alternative 3: Source Removal and Offsite Disposal in Contiguous U.S. (e.g., Oregon)	$11,944	$19,349	Table B-1b
Lead-contaminated Soil Alternative Description	**Unit Price per Ton[1,2]**	**Estimated Total Cost[1]**	**Reference**
Alternative 1: No Action	$0	$0	N/A
Alternative 2: Land Use Controls (over 30 years)	$46,947	$76,053	Table B-2a
Alternative 3: Source Removal and Offsite Disposal in Contiguous U.S. (e.g., Oregon)	$11,724	$18,992	Table B-2b
BaP-contaminated Soil Alternative Description	**Unit Price per Ton[1,2]**	**Estimated Total Cost[1]**	**Reference**
Alternative 1: No Action	$0	$0	N/A
Alternative 2: Land Use Controls (over 30 years)	$25,756	$83,449	Table B-3a
Alternative 3: Source Removal and Offsite Disposal in Contiguous U.S. (e.g., Oregon)	$8,841	$28,292	Table B-3b
Total Cleanup Cost at LLRC for Selected Remedies	N/A	**$66,633**	N/A

Notes:

1. Detailed cost worksheets used to derive these cost summaries are contained in Appendix B.
2. Unit prices per ton are based on the total weight, 1.6 tons for PCB and lead and 3.2 tons for BaP
3. The total cleanup cost of $66,633 is based on Alternative 3 as the selected remedy for PCB, lead, and BaP soil.

Abbreviations:

BaP – benzo(a)pyrene LLRC – Lake Louise Recreation Camp N/A – not applicable
PCB – polychlorinated biphenyl

Formatting:

Yellow shaded cell indicates cost of selected remedy
Bold and yellow shaded cell indicates total cost for selected remedies

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5.0 RECOMMENDATIONS

This section presents the preferred remedial alternative for addressing contaminated soil at the LLRC based on the evaluations conducted in Sections 3.0 and 4.0. Factors to consider when implementing the preferred alternative are discussed. A summary cost table was provided in Section 4 (Table 4-2).

5.1 PCB-Contaminated Soil

The Power Plant Area contains PCB-contaminated soil greater than 1 mg/Kg. Three remedial alternatives were considered in Section 4.0 for addressing the PCB-contaminated soil at the LLRC Power Plant Area, including:

- Alternative 1: No Action;
- Alternative 2: Land Use Controls; and
- Alternative 3: Source Removal and Offsite Disposal in Contiguous U.S. (e.g., Oregon).

5.1.1 Selected Remedy

Based on a detailed evaluation of the alternatives, the preferred remedial alternative for addressing PCB-contaminated soil is source removal and offsite disposal (Alternative 3). Under Alternative 3, all PCB-contaminated soil with concentrations greater than 1 mg/Kg would be containerized in super sacks for shipment and offsite disposal at a TSDF located in the Contiguous U.S. This alternative is an effective and implementable remedy, and has the lowest long-term costs. See Table 4-2 for a comparison of costs for the alternatives.

After the PCB-contaminated soil is removed, confirmation samples would be collected from the excavation to ensure that all PCB-contaminated soil with concentrations greater than the cleanup level (1 mg/Kg) had been removed. After sampling, the area would be backfilled with clean fill. It is assumed the backfill can be obtained from a nearby gravel source.

5.2 Lead-Contaminated Soil

The Lodge Area Upper UST contains lead-contaminated soil greater than 400 mg/Kg. Three remedial alternatives were considered in Section 4.0 for addressing the lead-contaminated soil, including:

- Alternative 1: No Action;
- Alternative 2: Land Use Controls; and
- Alternative 3: Source Removal and Offsite Disposal in Contiguous U.S. (e.g., Oregon).

5.2.1 Selected Remedy

Based on a detailed evaluation of the alternatives, the preferred remedial alternative for addressing lead-contaminated soil is source removal and offsite disposal (Alternative 3). Under Alternative 3, all lead-contaminated soil with concentrations greater than 400 mg/Kg would be containerized in super sacks for shipment and offsite disposal in the Contiguous U.S. This alternative is an effective, readily implementable, and cost effective over the long-term.

After the lead-contaminated soil is removed, confirmation samples would be collected from the excavation to ensure that all lead-contaminated soil with concentrations greater than the cleanup level (400 mg/Kg) had been removed. After sampling, the area would be backfilled with clean fill. It is assumed the backfill can be obtained from a nearby gravel source.

5.3 BaP-Contaminated Soil

The Dining Hall Leach Field upper UST and the Shower Area upper UST contain BaP-contaminated soil greater than 0.49 mg/Kg. Three remedial alternatives were considered in Section 4.0 for addressing the BaP-contaminated soil, including:

- Alternative 1: No Action;
- Alternative 2: Land Use Controls; and
- Alternative 3: Source Removal and Offsite Disposal in Contiguous U.S. (e.g., Oregon).

5.3.1 Selected Remedy

Based on a detailed evaluation of the alternatives, the preferred remedial alternative for addressing BaP-contaminated soil is source removal and offsite disposal (Alternative 3). Under Alternative 3, all BaP-contaminated soil with concentrations greater than 0.49 mg/Kg would be containerized in super sacks for shipment and offsite disposal in the Contiguous U.S. (e.g., Oregon). This alternative is an effective, readily implementable, and cost effective over the long-term.

After the contaminated soil is removed, confirmation samples will be collected from the excavation to ensure that all contaminated soil with concentrations greater than the cleanup level (0.49 mg/Kg) had been removed. After sampling, the area would be backfilled with clean fill. It is assumed the backfill can be obtained from a nearby gravel source.

6.0 REFERENCES

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USEPA. 2011c *Technical Factsheet on: POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)*. http://www.epa.gov/ogwdw/pdfs/factsheets/soc/tech/pahs.pdf. Downloaded 11/21/2011.

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Appendix A

Applicable or Relevant and Appropriate Requirements

Table A-1 Potential Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability	Comments and Analysis/Rationale for Decision
Clean Air Act of 1963, as amended (42 U.S.C. 7401-7462)				
National Ambient Air Quality Standards (NAAQS)	40 Code of Federal Regulations (CFR) Part 50	Establishes primary and secondary NAAQS for ambient air quality to protect public health and welfare; focuses on sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, lead, and particulate matter.	Potentially Applicable	Applicable to alternatives that have the potential to impact ambient air quality.
Clean Water Act, as amended (33 U.S.C. Sect. 1251-1376)				
Toxic and Pretreatment Effluent Standards	40 CFR 307	Establish list of toxic pollutants and promulgate pretreatment standards for publicly-owned treatment works facility (POTW) discharges.	Potentially Applicable	Pertains to any discharge permits in effect at waste disposal facilities. All wastes generated from this action will be disposed of at appropriately licensed and permitted facilities.
Water Quality Criteria	40 CFR Part 131 Quality Criteria for Water 1976 1980 1986	Sets criteria for water quality based on toxicity to aquatic organisms and human health.	Potentially Applicable	Pertains to any discharge permits in effect at waste disposal facilities.
Toxic Substances Control Act				
Asbestos and Polychlorinated Biphenyl (PCB) Waste Removal	15 U.S.C. 2605	Applicable to storage and disposal of asbestos and PCB-contaminated material.	Potentially Applicable	Applicable to alternatives that involve removal of suspect asbestos-containing materials (ACM), and solid wastes/materials containing PCBs >50 parts per million (ppm), if present.

Table A-1 Potential Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability	Comments and Analysis/Rationale for Decision
USEPA PCB Spill Cleanup Policy	40 CFR 761, Subpart G	Cleanup policy applies to intentional and accidental spills of material containing at least 50 mg/L PCBs occurring after May 4 1987. For spills prior to that date, cleanup levels are established on a case-by-case basis, using the PCB cleanup policy as guidelines.	Potentially Applicable	PCB spills being addressed occurred prior to May 4 1987, but applicable as guidance.
PCB Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions	40 CFR 761	Contains parts addressing the storage and disposal of PCB remediation waste (subpart D) and cleanup site verification (subpart N and O).	Applicable	Applicable to sites that may generate PCB remediation waste.
Resource Conservation and Recovery Act of 1976 (as amended by HSWA of 1984) (40 U.S.C. 6901)				
Identification and Listing of Hazardous Waste	40 CFR Part 261	Defines those solid wastes that are subject to regulation as hazardous waste under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Applicable	Applicable to alternatives involving remote transport and disposal of wastes classified as hazardous.
Resource Conservation and Recovery Act (RCRA) Standards	55 FR 30798	Standards for Solid Waste Management Units (SWMUs)	Relevant and Appropriate	
RCRA	40 CFR 268.35, 263	Standard for generators of Hazardous Waste and Land disposal restrictions wastes specific prohibitions.	Relevant and Appropriate	

Table A-1 Potential Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability	Comments and Analysis/Rationale for Decision
Other				
Protection and Enhancement of Environmental Quality	Executive Order 11514	Requires federal agencies to demonstrate leadership in achieving the environmental quality goals of the National Environmental Policy Act; provides for consultation with federal, state, and local agencies.	Relevant and Appropriate	
Cleanup and Disposal	42 U.S.C 9620 (a)(4)	State laws concerning removal and remediation shall apply to facilities owned and operated by a department, agency, or instrumentality of the U.S. when facilities are not included on the NPL	Applicable	The remedy will comply with regulations through proper cleanup and disposal procedures. 18 AAC 75 cleanup levels will apply.
Historic Preservation Act	Section 106; 16 U.S. C. 470 *et seq.* 36 CFR 800	Requires actions to conserve historic properties, planning of actions to minimize harm to National Historic Landmarks.	Relevant and Appropriate	
Native American Grave Protection and Repatriation Act		Provides for the protection of Native American graves and for other related areas.	Relevant and Appropriate	

Table A-1 Potential Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability	Comments and Analysis/Rationale for Decision
Alaska State Regulations				
Oil and Hazardous Substances Pollution Control Regulations	18 AAC 75.300 – 18 AAC 75.390	Regulations establishing discharge reporting, cleanup, and disposal requirements for oil and other hazardous substances. Does not apply discharges from underground storage tanks (USTs). Provides cleanup standard for soil and groundwater.	Applicable	These regulations provide cleanup standards for petroleum and other hazardous substances. These regulations are directly applicable for comparison of constituent concentrations with cleanup standards.
Water Quality Standards	18 AAC 70	Specifies the degree of degradation that may not be exceeded in a water body due to human action.	Potentially Applicable	The regulations provide concentration levels that may not be exceeded (Alaska Water Quality Standards). Regulations primarily address surface water.
Soil and Solid Waste	18 AAC 60	Regulations for the management and disposal of solid waste, including soil	Applicable	

Table A-1 Potential Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability	Comments and Analysis/Rationale for Decision
Occupational Safety and Health Administration (OSHA) Regulations (29 U.S.C. 651)				
General Industrial Standards for Workers	29 Code of Federal Regulations (CFR) 1910.210	Required for the protection of workers, including requirements for responses involving hazardous substances (see Hazardous Waste Operations and Emergency Response [HAZWOPER] below)	Applicable	Remedial actions will involve hazardous substances.
Hazardous Waste Operations and Emergency Response (HAZWOPER)	29 CFR 1910.120 and 40 CFR 311	Worker projection during hazardous waste cleanup.	Applicable	Remedial actions will involve hazardous substances.
Resource Conservation and Recovery Act of 1976 (RCRA) (42 U.S.C. 6901)				
Standards for Waste Generators and Transporters	40 CFR Parts 262 and 263	Applicable to generators and transporters of hazardous waste. Requires that transporters must be licensed hazardous waste haulers.	Applicable	Applicable to alternatives that involve off-site transport and disposal of hazardous wastes.
Standards for Owners and Operators	40 CFR 264	Standards for owners and operators of hazardous waste facilities.	Potentially Applicable	Pertains to off-site waste disposal facilities. All wastes generated from this action will be disposed at appropriately licensed and permitted facilities.

Table A-1 Potential Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability	Comments and Analysis/Rationale for Decision
Management of Containers	40 CFR 264.171 through 264.178	Regulations cited under 40 CFR 264.171 to 264.178 (Subpart I) concern permanent onsite storage of hazardous wastes or temporary storage phases used during various cleanup actions such as removal or incineration.	Applicable	Applicable to alternatives that require use of temporary containers to hold hazardous wastes, if used.
RCRA Hazardous Waste Management Regulations, Subtitle C	40 CFR 264	Applicable to the treatment, storage, transportation and disposal of hazardous wastes listed under 40 CFR 261.	Applicable	Pertains to off-site waste disposal facilities. All wastes generated from this action will be disposed at appropriately licensed and permitted facilities.
RCRA Solid Waste Management Regulations, Subtitle D	40 CFR 264	Applicable to the management and disposal of nonhazardous wastes.	Applicable	Pertains to off-site waste disposal facilities. All wastes generated from this action will be disposed at appropriately licensed and permitted facilities.
Closure and Post Closure Requirements	40 CFR 261 and 117	Closure performance standard and care requirements, maintenance and monitoring of waste containment systems	Potentially Relevant and Appropriate	Requirements for closure and post closure of hazardous waste sites.
Standards for Post-Closure for Units with Hazardous waste In Place	40 CFR 264.310	Post-closure care consists of cover maintenance, groundwater monitoring, and institutional controls.	Potentially Applicable	Applicable to alternatives where hazardous waste is left in place.
RCRA Hazardous Waste Permit Program	40 CFR 270	USEPA-administered hazardous waste permit program.	Potentially Applicable	Pertains to off-site waste disposal facilities. All wastes generated from this action will be disposed at appropriately licensed and permitted facilities.

Table A-1 Potential Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability	Comments and Analysis/Rationale for Decision
Land Disposal Restrictions	40 CFR Part 268	Applicable to alternatives involving land disposal of hazardous wastes, and requires treatment to diminish a waste's toxicity and/or minimize contaminant migration.	Applicable	Pertains to off-site waste disposal facilities. All wastes generated from this action will be disposed at appropriately licensed and permitted facilities.
Other Federal Waste Transport Regulations				
Hazardous Materials Transportation	40 CFR 107, 171-177	Transportation regulations for shippers and transporters of hazardous materials	Potentially Applicable	Applicable if off-site transport of hazardous waste.
National Pollutant Discharge Elimination System (NPDES) Permit Regulations	40 CFR Part 122	Establishes permit requirements, discharge limits, and requirements for use of the Best Available Technology (BAT) for discharges of wastewaters and storm water to surface waters.	Relevant and Appropriate	Pertains to any discharge permits in effect at off-site waste disposal facilities.
USEPA Effluent Guidelines and Standards	40 CFR 403.5	If wastes are discharged to a publicly owned treatment works facility (POTW), the treatment process must not allow waste to pass through untreated or result in contaminated sewage sludge.	Relevant and Appropriate	Pertaining to any permits to discharge to POTWs in effect at off-site waste disposal facilities.
Soil and Water Resources Conservation Act of 1977	16 U.S.C. 2001 (1991)	Provides for the conservation of soil, water and related resources for sustained use.	Relevant and Appropriate	

Appendix B
Cost Estimating Worksheets for Remedial Alternatives

Appendix B, Table B-1
Lake Louise Cost Estimating Worksheets: PCB-Contaminated Soil Alternatives

PCB-Contaminated Soil Treatment/Disposal Alternatives Comparison			
Description	**Estimated Amount**	**Price per Ton (1.6 tons)**	**Reference**
No Action	**$0**	**$0**	Not Applicable
Land Use Controls (over 30 years)	**$76,053**	**$46,947**	Table B-1a
Offsite Disposal in the Contiguous U.S (e.g., Oregon)	**$19,349**	**$11,944**	Table B-1b

General Notes for all Estimates

1. Site Construction Quality Control & Site Safety Position may be served by the same person.
2. Wages and overhead rates are based on market rates for professional labor and current craft labor rates (Davis Bacon).
3. The construction manager is assumed to spend 2 hours for every day a task is occurring. The administrator is assumed to work 1 hour per day of each task. Both are considered office positions. Onsite superintendent is assumed to spend 50% of craft labor hours on each task and SSHO is assumed to spend 25% of craft labor hours on each task.
4. PPE use is based on the total number of mandays during the field work.
5. It was assumed that all remedial action work at the LLRC would occur concurrently with other work in the area; therefore, mobilization and demobilization costs were not included in the remedial cost estimates for PCB-contaminated soil at the Power Plant Area.

Appendix B, Table B-1
LLRC Cost Estimating Worksheets: PCB-Contaminated Soil Alternatives

Table B-1a: Land Use Controls

Description:
This estimate covers the cost of implementing Land Use Controls for PCB-contaminated soil the LLRC Power Plant Area. The estimated total surface area of contaminated soil is 18 ft^2. The soil would be capped with a 2-foot lift of gravel salvaged from a nearby gravel source (2 yd^3) at no cost. Fencing would be installed around the area after the cap is in place to prevent human and animal access to the contaminated soils. Signs would be posted on the fence to warn site visitors of the presence of contaminated soil. Monitoring (visual) of the overall site conditions will be conducted every 5 years for 30 years.

Installation Costs - Work Plan, Fencing, and Signage

LABOR

Classification	Cost	Sub Total	Extension
Professional Labor - Reporting			
Plan (for installation and LTM)	$ 2,500	$ 2,500	$ 2,500
Construction Reports	$ 4,000	$ 4,000	$ 4,000
			SUBTOTAL $ 6,500

LABOR

Classification	Pay Unit	Hourly Rate	Hours	Workers	Extension
Professional Labor - Construction Management					
Sr. Construction Manager (Office)	per hour	$ 119.91	4	1	$ 528
Administrator (Office)	per hour	$ 53.29	2	1	$ 117
Superintendent	per hour	$ 98.78	13	1	$ 1,304
SSHO/CQC	per hour	$ 90.78	7	1	$ 599
Local Craft DB Labor					
Operator Gp 1	per hour	$ 74.45	2	2	$ 298
Operator Gp 1 OT	per hour	$ 99.81	1	2	$ 200
Labor Gp 1	per hour	$ 65.59	16	2	$ 2,099
Labor Gp 1 OT	per hour	$ 85.89	8	2	$ 1,374
Environmental Field Support					
Mid Level Environmental Scientist	per hour	$ 90.00	26	1	$ 2,376
				SUBTOTAL	$ 8,894

EQUIPMENT

ITEM	Units	Unit	Rate	Quantity	Extension
Crew / tools transport (6 wheeler)	1	Month	$ 2,500	0.1	$ 167
End Dump (12 CY Capacity)	1	Day	$ 350	1	$ 350
Excavator, CAT 312 equivalent	1	Day	$ 460	1	$ 460
				SUBTOTAL	$ 977

MATERIALS

ITEM	Description	Unit	Rate	Quantity	Extension
Misc Supplies	Lump Sum	1	$ 250	1	$ 250
Warning Signs	signs	each	$ 119	2	$ 239
Chain-link fencing materials	20 feet	LS	$ 500	1	$ 500
Connections, hardware for signs	hardware	LS	$ 75	2	$ 150
Quikrete - 40 lb bag (1/3 cu.ft / bag)	bag	bag	$ 10	6	$ 60
Fuel (4.4 gal/hr)	Diesel/gas	Gallon	$ 4.50	21	$ 95
				SUBTOTAL	$ 1,294

OTHER DIRECT COSTS

ITEM	Description	Unit	Rate	Quantity	Extension
Communication (on site, long distance, etc)	COMMS	minute	$ 1.50	120	$ 180
Per Diem	Per Diem	manday	$ 140	10	$ 1,400
PPE/Safety	PPE/Safety	manday	$ 15	10	$ 150
				SUBTOTAL	$ 1,730

Monitoring and Maintenance (30 Years)

LABOR

Classification	Pay Unit	Hourly Rate	Hours per Year	Personnel	Extension
Labor - Monitoring and Maintenance (1st Event Performed 5 Years after Capping - 10% cost escalation)					
Perform visual inspections and minor maintenance; prepare inspection reports. Aminis	per hour	$ 99.00	45	1	$ 4,455
					SUBTOTAL $ 4,455

OTHER DIRECT COSTS - 1st Event Performed 5 Years after Capping - 10% cost escalation

ITEM	Description	Unit	Rate	Quantity	Extension
Travel (Anchorage to Lake Louise)	RT	mile	$ 0.56	570	$ 320
Misc. Supplies	general	LS	$ 60	1	$ 60
Per diem	per diem	manday	$ 154	2	$ 308
				SUBTOTAL	$ 688

Monitoring and Maintenance - Year 10 (2nd Event)	SUBTOTAL	$ 6,269
Monitoring and Maintenance - Year 15 (3rd Event)	SUBTOTAL	$ 6,921
Monitoring and Maintenance - Year 20 (4th Event)	SUBTOTAL	$ 7,642
Monitoring and Maintenance - Year 25 (5th Event)	SUBTOTAL	$ 8,437
Monitoring and Maintenance - Year 30 (6th Event)	SUBTOTAL	$ 9,315

COST SUMMARY

Cost		$	63,123
Project Management (PM)	10.0%	$	6,312
G&A on non-labor costs	10.0%	$	985
Subtotal		**$**	**70,420**
Profit	8.0%	$	5,634
Cost Escalation	0.0%	$	-
Labor rates include G&A	**TOTAL**	**$**	**76,053**
PM is % of cost	**Cost per Ton**	**$**	**46,947**

Cost Escalation applied to Subtotal and Profit

SUBTOTALS

LABOR	$	53,274
EQUIPMENT	$	977
MATERIALS	$	1,294
ODC	$	7,578
SUBCONTRACT	$	-
SUBTOTAL	**$**	**63,123**

SUBTOTALS - Institutional Controls

Installation	$	23,473
30-Year Monitoring and Maintenance	$	52,580
Average Monitoring and Maintenance Costs per Year	$	1,753

Assumptions:
It is assumed the equipment and personnel are already onsite for other work (no mobilization or demobilization included for construction phase). A 2-foot gravel cap will be placed over the PCB-contaminated soil with the use of an excavator and an operator, taking an estimated 2 hours. It is assumed gravel can be obtained from nearby gravel sources with little to no hauling distance. Institutional controls (fencing and signage) will be installed by two laborers over the course of two days. Monitoring every 5 years was estimated for 30 years with a 2% per year compounding cost escalation. The routine maintenance will consist of securing and repairing fencing and signs. The inspection reports will be brief and consist of a checklist of items. The estimate includes travel for a professional from Anchorage to perform the site inspections and reporting.

Appendix B, Table B-1
Lake Louise Cost Estimating Worksheets: PCB-Contaminated Soil Alternatives

Table B-1b: Excavation and Offsite Disposal in the Contiguous U.S. of PCB-Contaminated Soil

Description:
This scenario involves the cost to excavate and transport PCB-contaminated soil (PCBs > 1 mg/Kg) from LLRC out of Alaska for disposal in the lower 48 states. An estimated 1 yd^3 (1.6 tons) of excavated soil from the Power Plant Area is included in this estimate. Confirmation soil samples will be collected following excavation. The soil will be placed into 1 yd^3 super sacks and driven to Anchorage, Alaska. The soil will be then be shipped to Oregon for disposal.

Planning and Reporting (Documentation Labor)

Classification	Lump Sum Cost	Subtotal	Extension
Professional Labor			
Plan (for removal action)	$2,500	$ 2,500	$ 2,500
Report	$5,000	$ 5,000	$ 5,000
			SUBTOTAL $ 7,500

Classification	Pay Unit	Hourly Rate	Hours	Workers	Extension
Professional Labor - Construction Management					
Sr. Construction Manager (Office)	per hour	$ 119.91	2	1	$ 240
Administrator (Office)	per hour	$ 53.29	1	1	$ 53
Superintendent	per hour	$ 98.78	6	1	$ 593
SSHO/CQC	per hour	$ 90.78	3	1	$ 272
Local Craft DB Labor (Containerization and Shipping)					
Operator Gp 1	per hour	$ 74.45	8	2	$ 1,191
Operator Gp 1 OT	per hour	$ 99.81	4	2	$ 799
Labor Gp 1	per hour	$ 65.59	8	1	$ 525
Labor Gp 1 OT	per hour	$ 85.89	4	1	$ 344
Environmental Field Support					
Mid Level Environmental Scientist	per hour	$ 90.00	12	1	$ 1,080
				SUBTOTAL	$ 5,096

EQUIPMENT

ITEM	Units	Unit	Rate	Quantity	Extension
Excavator, CAT 312 equivalent	1	Day	$ 460	1	$ 460
End Dump (12 CY Capacity)	1	Day	$ 350	1	$ 350
Crew / tools transport (6 wheeler)	1	Month	$ 2,500	0.1	$ 250
				SUBTOTAL	$ 1,060

MATERIALS/CONSUMABLES

ITEM	Description	Unit	Rate	Quantity	Extension
Fuel (4.4 gal/hr)	Diesel/gas	Gallon	$ 4.50	27	$ 122
Super sacks (1 CY), with 3 mil HDPE liner	Containers	ea	$ 18.24	2	$ 36
				SUBTOTAL	$ 158

OTHER DIRECT COSTS

ITEM	Description	Unit	Rate	Quantity	Extension
Communication (on site, long distance, etc)	COMMS	minute	$ 1.50	60	$ 90
PPE/Safety, and misc supplies.	PPE/Safety	manday	$ 30	5	$ 150
Per diem	per diem	manday	$ 140	5	$ 700
				SUBTOTAL	$ 940

SUBCONTRACTORS

COMPANY	Description	Unit	Rate	Quantity	Extension
Lab analysis (PCBs in soil)	lab analysis	each	$ 85	5	$ 425
Transport and disposal of soil to Columbia Ridge, Oregon	transport/disposal	LS	$ 800	1	$ 800
				SUBTOTAL	$ 1,225

SUBTOTALS	
LABOR	$ 12,596
EQUIPMENT	$ 1,060
MATERIALS	$ 158
ODC	$ 940
SUBCONTRACT	$ 1,225
TOTAL	$ 15,979

COST SUMMARY

Cost		$	15,979
Project Management (PM)	10.0%	$	1,598
G&A on non-labor costs	10.0%	$	338
Subtotal		**$**	**17,915**
Profit	8.0%	$	1,433
Cost Escalation	0.0%	$	-
Labor rates include G&A	**TOTAL**	**$**	**19,349**
PM is % of cost	**Cost per Ton**	**$**	**11,944**

Cost Escalation applied to Subtotal and Profit

Assumptions
It is assumed the equipment and personnel are already onsite for other work (no mobilization or demobilization included in construction phase). Excavation, super sack filling, and backfilling will take an estimated 1 day to complete. Backfill material is assumed to be available in the immediate vicinity at no additional cost. Following excavation, 2 soil samples will be collected and analyzed for PCBs based on ADEC guidance of 2 samples for the first 250 square feet of excavation, plus a duplicate sample. However, 2 more samples were added as contingency.

Table B-1c. Labor Buildup

Professional Labor Buildup (2011)		
	Pay Unit	Hourly Billing Rate
Construction Manager	per hour	$ 119.91
Administrator	per hour	$ 53.29
Site Superintendent	per hour	$ 98.78
SSHO/CQC	per hour	$ 90.78
Scientist - Entry (Field Support)	per hour	$ 70.00
Regulatory Specialist (Waste Coordinator)	per hour	$ 124.02
Midlevel Environmental Scientist	per hour	$ 90.00

Craft Labor Buildup (2011)						
	Pay Unit	Hourly Pay	Fringe	Subtotal	G&A and Profit	Hourly Billing Rate
					40.00%	
Operator Gp 1	per hour	$ 36.23	$ 16.95	$ 53.18	$ 21.27	$ 74.45
Operator Gp 1 OT	per hour	$ 54.35	$ 16.95	$ 71.30	$ 28.52	$ 99.81
Labor Gp 1	per hour	$ 29.00	$ 17.85	$ 46.85	$ 18.74	$ 65.59
Labor Gp 1 OT	per hour	$ 43.50	$ 17.85	$ 61.35	$ 24.54	$ 85.89

General Notes:

1 - Professional labor rates are based on current market rates for the year 2011.

2 - Craft labor rates (Hourly pay and Fringe) are based on wage rates from General Decision Number: AK20100001 12/10/2010 AK1 (Davis Bacon). A 40% markup was applied to craft labor rates to cover labor burden and G&A.

Table B-1d: Unit Cost Summary
Lake Louise Supplemental FS for PCBs

Item	Unit	Cost	Source
LABOR			
Professional Labor	Hour	Varies	Current market rates based on professional judgment and knowledge
Local Craft DB labor	Hour	Varies	General Decision Number: AK20100001 12/10/2010 AK1 (Davis Bacon)
EQUIPMENT			
Utility Vehicle, 6 wheeler, crew / tools transport	Month	$ 2,500	Based on 2009 rental costs for field work
End Dump (12 CY Capacity)	Day	$ 350	NC Machinery, Anchorage
Excavator, CAT 312 equivalent	Day	$ 460	NC Machinery, Anchorage
MATERIALS			
Fuel (4.4 gal/hr)	gallon	$ 4.50	Fuel cost based on 4/18/11 gas price in Glennallen.
Super sacks (1 CY), with 3 mil HDPE liner	ea	$ 18.24	BAGcorp, Inc.
Monitoring Work Plan	ea	$ 5,000	Engineer's estimate
Signage	ea	$ 119	Graphic Works (10-30-08)
Chain-link fencing materials	LS	$ 500	Home Depot
Connections, hardware for signs	ea	$ 75	Spenard Builders Supply
Quikrete - 40 lb bag (1/3 cu.ft / bag)	bag	$ 10	Spenard Builders Supply
OTHER DIRECT COSTS			
Communication (on site, long distance, etc)	minute	$ 1.50	Engineer's estimate
Per Diem	manday	$ 140	Lake Louise Lodge (4/18/2011)
PPE/Safety	manday	$ 15	Engineer's estimate
Travel (Anchorage to Lake Louise)	mile	$ 0.51	IRS Mileage Rate
SUBCONTRACTORS			
Transport and disposal of soil to Oregon	LS	$ 800	Ahtna Enginneering Services, LLC
Lab analysis (PCBs in soil)	each	$ 85	SGS Laboratory (Anchorage)

Appendix B, Table B-2
LLRC Cost Estimating Worksheets: Lead-Contaminated Soil Alternatives

Lead-Contaminated Soil Treatment/Disposal Alternatives Comparison			
Description	**Estimated Amount**	**Price per Ton (1.6 tons)**	**Reference**
No Action	**$0**	**$0**	Not Applicable
Land Use Controls (over 30 years)	**$76,053**	**$46,947**	Table B-2a
Offsite Disposal in the Contiguous U.S. (e.g., Oregon)	**$18,992**	**$11,724**	Table B-2b

General Notes for all Estimates

1. Site Construction Quality Control & Site Safety Position may be served by the same person.
2. Wages and overhead rates are based on market rates for professional labor and current craft labor rates (Davis Bacon).
3. The construction manager is assumed to spend 2 hours for every day a task is occurring. The administrator is assumed to work 1 hour per day of each task. Both are considered office positions. Onsite superintendent is assumed to spend 50% of craft labor hours on each task and SSHO is assumed to spend 25% of craft labor hours on each task.
4. PPE use is based on the total number of mandays during the field work.
5. It was assumed that all remedial action work at the LLRC would occur concurrently with other work in the area; therefore, mobilization and demobilization costs were not included in the remedial cost estimates.

Appendix B, Table B-2
LLRC Cost Estimating Worksheets: Lead-Contaminated Soil Alternatives

Table B-2a: Land Use Controls

Description:
This estimate covers the cost of implementing Land Use Controls for lead-contaminated soil the LLRC Lodge Area. The estimated total surface area of contaminated soil is 18 ft^2. The soil would be capped with a 2-foot lift of gravel obtainedfrom a nearby gravel source (2 yd^3) at no cost. Fencing would be installed around the area after the cap is in place to prevent human and animal access to the contaminated soils. Signs would be posted on the fence to warn site visitors of the presence of contaminated soil. Monitoring (visual) of the overall site conditions will be conducted every 5 years for 30 years.

Installation Costs - Work Plan, Fencing, and Signage

LABOR

Classification	Cost	Sub Total	Extension
Professional Labor - Reporting			
Plan (for installation and LTM)	$ 2,500	$ 2,500	$ 2,500
Construction Reports	$ 4,000	$ 4,000	$ 4,000
			SUBTOTAL $ 6,500

LABOR

Classification	Pay Unit	Hourly Rate	Hours	Workers	Extension
Professional Labor - Construction Management					
Sr. Construction Manager (Office)	per hour	$ 119.91	4	1	$ 528
Administrator (Office)	per hour	$ 53.29	2	1	$ 117
Superintendent	per hour	$ 98.78	13	1	$ 1,304
SSHO/CQC	per hour	$ 90.78	7	1	$ 599
Local Craft DB Labor					
Operator Gp 1	per hour	$ 74.45	2	2	$ 298
Operator Gp 1 OT	per hour	$ 99.81	1	2	$ 200
Labor Gp 1	per hour	$ 65.59	16	2	$ 2,099
Labor Gp 1 OT	per hour	$ 85.89	8	2	$ 1,374
Environmental Field Support					
Mid Level Environmental Scientist	per hour	$ 90.00	26	1	$ 2,376
				SUBTOTAL	$ 8,894

EQUIPMENT

ITEM	Units	Unit	Rate	Quantity	Extension
Crew / tools transport (6 wheeler)	1	Month	$ 2,500	0.1	$ 167
End Dump (12 CY Capacity)	1	Day	$ 350	1	$ 350
Excavator, CAT 312 equivalent	1	Day	$ 460	1	$ 460
				SUBTOTAL	$ 977

MATERIALS

ITEM	Description	Unit	Rate	Quantity	Extension
Misc Supplies	Lump Sum	1	$ 250	1	$ 250
Warning Signs	signs	each	$ 119	2	$ 239
Chain-link fencing materials	20 feet	LS	$ 500	1	$ 500
Connections, hardware for signs	hardware	LS	$ 75	2	$ 150
Quikrete - 40 lb bag (1/3 cu.ft / bag)	bag	bag	$ 10	6	$ 60
Fuel (4.4 gal/hr)	Diesel/gas	Gallon	$ 4.50	21	$ 95
				SUBTOTAL	$ 1,294

OTHER DIRECT COSTS

ITEM	Description	Unit	Rate	Quantity	Extension
Communication (on site, long distance, etc)	COMMS	minute	$ 1.50	120	$ 180
Per Diem	Per Diem	manday	$ 140	10	$ 1,400
PPE/Safety	PPE/Safety	manday	$ 15	10	$ 150
				SUBTOTAL	$ 1,730

Monitoring and Maintenance (30 Years)

LABOR

Classification	Pay Unit	Hourly Rate	Hours per Year	Personnel	Extension
Labor - Monitoring and Maintenance (1st Event Performed 5 Years after Capping - 10% cost escalation)					
Perform visual inspections and minor maintenance; prepare inspection reports. Aminis	per hour	$ 99.00	45	1	$ 4,455
					SUBTOTAL $ 4,455

OTHER DIRECT COSTS - 1st Event Performed 5 Years after Capping - 10% cost escalation

ITEM	Description	Unit	Rate	Quantity	Extension
Travel (Anchorage to Lake Louise)	RT	mile	$ 0.56	570	$ 320
Misc. Supplies	general	LS	$ 60	1	$ 60
Per diem	per diem	manday	$ 154	2	$ 308
				SUBTOTAL	$ 688

Monitoring and Maintenance - Year 10 (2nd Event)	SUBTOTAL	$ 6,269
Monitoring and Maintenance - Year 15 (3rd Event)	SUBTOTAL	$ 6,921
Monitoring and Maintenance - Year 20 (4th Event)	SUBTOTAL	$ 7,642
Monitoring and Maintenance - Year 25 (5th Event)	SUBTOTAL	$ 8,437
Monitoring and Maintenance - Year 30 (6th Event)	SUBTOTAL	$ 9,315

COST SUMMARY

Cost		$	63,123
Project Management (PM)	10.0%	$	6,312
G&A on non-labor costs	10.0%	$	985
Subtotal		**$**	**70,420**
Profit	8.0%	$	5,634
Cost Escalation	0.0%	$	-
Labor rates include G&A	**TOTAL**	**$**	**76,053**
PM is % of cost	**Cost per Ton**	**$**	**46,947**

Cost Escalation applied to Subtotal and Profit

SUBTOTALS

LABOR	$	53,274
EQUIPMENT	$	977
MATERIALS	$	1,294
ODC	$	7,578
SUBCONTRACT	$	-
SUBTOTAL	**$**	**63,123**

SUBTOTALS - Institutional Controls

Installation	$	23,473
30-Year Monitoring and Maintenance	$	52,580
Average Monitoring and Maintenance Costs per Year	$	1,753

Assumptions:
It is assumed the equipment and personnel are already onsite for other work (no mobilization or demobilization included for construction phase). A 2-foot gravel cap will be placed over the contaminated soil with the use of an excavator and an operator, taking an estimated 2 hours. It is assumed gravel can be obtained from nearby gravel sources with little to no hauling distance. It also assumes the UST excavation is already fillled in. Institutional controls (fencing and signage) will be installed by two laborers over the course of two days. Monitoring every 5 years was estimated for 30 years with a 2% per year compounding cost escalation. The routine maintenance will consist of securing and repairing fencing and signs. The inspection reports will be brief and consist of a checklist of items. The estimate includes travel for a professional from Anchorage to perform the site inspections and reporting.

Appendix B, Table B-2
LLRC Cost Estimating Worksheets: Lead-Contaminated Soil Alternatives

Table B-2b: Excavation and Offsite Disposal in the Contiguous U.S. of Lead-Contaminated Soil

Description:
This scenario involves the cost to excavate and transport lead-contaminated soil (> 400 mg/Kg) from LLRC out of Alaska for disposal in the lower 48 states. An estimated 1 yd^3 (1.6 tons) of excavated soil from the Lodge UST Area is included in this estimate. Confirmation soil samples will be collected following excavation. The soil will be placed into 1 yd^3 super sacks and driven to Anchorage, Alaska. The soil will be then be shipped to Oregon for disposal.

Planning and Reporting (Documentation Labor)

Classification	Lump Sum Cost	Subtotal	Extension
Professional Labor			
Plan (for removal action)	$2,500	$ 2,500	$ 2,500
Report	$5,000	$ 5,000	$ 5,000
			SUBTOTAL $ 7,500

Classification	Pay Unit	Hourly Rate	Hours	Workers	Extension
Professional Labor - Construction Management					
Sr. Construction Manager (Office)	per hour	$ 119.91	2	1	$ 240
Administrator (Office)	per hour	$ 53.29	1	1	$ 53
Superintendent	per hour	$ 98.78	6	1	$ 593
SSHO/CQC	per hour	$ 90.78	3	1	$ 272
Local Craft DB Labor (Containerization and Shipping)					
Operator Gp 1	per hour	$ 74.45	8	2	$ 1,191
Operator Gp 1 OT	per hour	$ 99.81	4	2	$ 799
Labor Gp 1	per hour	$ 65.59	8	1	$ 525
Labor Gp 1 OT	per hour	$ 85.89	4	1	$ 344
Environmental Field Support					
Mid Level Environmental Scientist	per hour	$ 90.00	12	1	$ 1,080
				SUBTOTAL	$ 5,096

EQUIPMENT

ITEM	Units	Unit	Rate	Quantity	Extension
Excavator, CAT 312 equivalent	1	Day	$ 460	1	$ 460
End Dump (12 CY Capacity)	1	Day	$ 350	1	$ 350
Crew / tools transport (6 wheeler)	1	Month	$ 2,500	0.1	$ 250
				SUBTOTAL	$ 1,060

MATERIALS/CONSUMABLES

ITEM	Description	Unit	Rate	Quantity	Extension
Fuel (4.4 gal/hr)	Diesel/gas	Gallon	$ 4.50	27	$ 122
Super sacks (1 CY), with 3 mil HDPE liner	Containers	ea	$ 18.24	2	$ 36
				SUBTOTAL	$ 158

OTHER DIRECT COSTS

ITEM	Description	Unit	Rate	Quantity	Extension
Communication (on site, long distance, etc)	COMMS	minute	$ 1.50	60	$ 90
PPE/Safety, and misc supplies.	PPE/Safety	manday	$ 30	5	$ 150
Per diem	per diem	manday	$ 140	5	$ 700
				SUBTOTAL	$ 940

SUBCONTRACTORS

COMPANY	Description	Unit	Rate	Quantity	Extension
Lab analysis (lead in soil)	lab analysis	each	$ 25	6	$ 150
Transport and disposal of soil to Columbia Ridge, Oregon	transport/disposal	LS	$ 800	1	$ 800
				SUBTOTAL	$ 950

SUBTOTALS	
LABOR	$ 12,596
EQUIPMENT	$ 1,060
MATERIALS	$ 158
ODC	$ 940
SUBCONTRACT	$ 950
TOTAL	$ 15,704

COST SUMMARY

Cost		$	15,704
Project Management (PM)	10.0%	$	1,570
G&A on non-labor costs	10.0%	$	311
Subtotal		**$**	**17,585**
Profit	8.0%	$	1,407
Cost Escalation	0.0%	$	-
Labor rates include G&A	**TOTAL**	**$**	**18,992**
PM is % of cost	**Cost per Ton**	**$**	**11,724**

Cost Escalation applied to Subtotal and Profit

Assumptions
It is assumed the equipment and personnel are already onsite for other work (no mobilization or demobilization included in construction phase). Excavation, super sack filling, and backfilling will take an estimated 1 day to complete. Backfill material is assumed to be available in the immediate vicinity at no additional cost. Following excavation, 6 soil samples will be collected and analyzed for lead based on ADEC guidance, plus a duplicate sample (includes sidewall samples and contingency). Time and materials to backfill the entire, original ,USTexcavation not included because that would occur regardless of contamianted soil removal. The subject lead-contaminated soil is not a RCRA waste (TCLP lead < 5 m/L).

Table B-2c. Labor Buildup

Professional Labor Buildup (2011)		
	Pay Unit	Hourly Billing Rate
Construction Manager	per hour	$ 119.91
Administrator	per hour	$ 53.29
Site Superintendent	per hour	$ 98.78
SSHO/CQC	per hour	$ 90.78
Scientist - Entry (Field Support)	per hour	$ 70.00
Regulatory Specialist (Waste Coordinator)	per hour	$ 124.02
Midlevel Environmental Scientist	per hour	$ 90.00

Craft Labor Buildup (2011)						
	Pay Unit	Hourly Pay	Fringe	Subtotal	G&A and Profit	Hourly Billing Rate
					40.00%	
Operator Gp 1	per hour	$ 36.23	$ 16.95	$ 53.18	$ 21.27	$ 74.45
Operator Gp 1 OT	per hour	$ 54.35	$ 16.95	$ 71.30	$ 28.52	$ 99.81
Labor Gp 1	per hour	$ 29.00	$ 17.85	$ 46.85	$ 18.74	$ 65.59
Labor Gp 1 OT	per hour	$ 43.50	$ 17.85	$ 61.35	$ 24.54	$ 85.89

General Notes:

1 - Professional labor rates are based on current market rates for the year 2011.

2 - Craft labor rates (Hourly pay and Fringe) are based on wage rates from General Decision Number: AK20100001 12/10/2010 AK1 (Davis Bacon). A 40% markup was applied to craft labor rates to cover labor burden and G&A.

Table B-2d: Unit Cost Summary
Lake Louise Supplemental FS for Lead

Item	Unit	Cost	Source
LABOR			
Professional Labor	Hour	Varies	Current market rates based on professional judgment and knowledge
Local Craft DB labor	Hour	Varies	General Decision Number: AK20100001 12/10/2010 AK1 (Davis Bacon)
EQUIPMENT			
Utility Vehicle, 6 wheeler, crew / tools transport	Month	$ 2,500	Based on 2009 rental costs for field work
End Dump (12 CY Capacity)	Day	$ 350	NC Machinery, Anchorage
Excavator, CAT 312 equivalent	Day	$ 460	NC Machinery, Anchorage
MATERIALS			
Fuel (4.4 gal/hr)	gallon	$ 4.50	Fuel cost based on 4/18/11 gas price in Glennallen.
Super sacks (1 CY), with 3 mil HDPE liner	ea	$ 18.24	BAGcorp, Inc.
Monitoring Work Plan	ea	$ 5,000	Engineer's estimate
Signage	ea	$ 119	Graphic Works (10-30-08)
Chain-link fencing materials	LS	$ 500	Home Depot
Connections, hardware for signs	ea	$ 75	Spenard Builders Supply
Quikrete - 40 lb bag (1/3 cu.ft / bag)	bag	$ 10	Spenard Builders Supply
OTHER DIRECT COSTS			
Communication (on site, long distance, etc)	minute	$ 1.50	Engineer's estimate
Per Diem	manday	$ 140	Lake Louise Lodge (4/18/2011)
PPE/Safety	manday	$ 15	Engineer's estimate
Travel (Anchorage to Lake Louise)	mile	$ 0.51	IRS Mileage Rate
SUBCONTRACTORS			
Transport and disposal of soil to Oregon	LS	$ 800	
Lab analysis (Lead in soil)	each	$ 25	SGS Laboratory (Anchorage)

Appendix B, Table B-3
LLRC Cost Estimating Worksheets: BaP-Contaminated Soil Alternatives

BaP-Contaminated Soil Treatment/Disposal Alternatives Comparison			
Description	**Estimated Amount**	**Price per Ton (3.2 tons)**	**Reference**
No Action	**$0**	**$0**	Not Applicable
Land Use Controls (over 30 years)	**$83,449**	**$25,756**	Table B-3a
Offsite Disposal in the Contiguous U.S. (e.g., Oregon)	**$28,292**	**$8,841**	Table B-3b

General Notes for all Estimates

1. Site Construction Quality Control & Site Safety Position may be served by the same person.
2. Wages and overhead rates are based on market rates for professional labor and current craft labor rates (Davis Bacon).
3. The construction manager is assumed to spend 2 hours for every day a task is occurring. The administrator is assumed to work 1 hour per day of each task. Both are considered office positions. Onsite superintendent is assumed to spend 50% of craft labor hours on each task and SSHO is assumed to spend 25% of craft labor hours on each task.
4. PPE use is based on the total number of mandays during the field work.
5. It was assumed that all remedial action work at the LLRC would occur concurrently with other work in the area; therefore, mobilization and demobilization costs were not included in the remedial cost estimates.

Appendix B, Table B-3
Lake Louise Cost Estimating Worksheets: BaP-Contaminated Soil Alternatives

Table B-3a: Land Use Controls

Description:
This estimate covers the cost of implementing Land Use Controlsfor BaP-contaminated soil at the LLRC Dinning Hall and Shower Area. The estimated total surface area of contaminated soil at each location is 18 ft^2. The soil would be capped with a 2-foot lift of gravel salvaged from a nearby gravel source (2 yd^3) at no cost. Fencing would be installed around the area after the cap is in place to prevent human and animal access to the contaminated soils. Signs would be posted on the fence to warn site visitors of the presence of contaminated soil. Monitoring (visual) of the overall site conditions will be conducted every 5 years for 30 years.

Installation Costs - Work Plan, Fencing, and Signage

LABOR

Classification	Cost	Sub Total	Extension
Professional Labor - Reporting			
Plan (for installation and LTM)	$ 3,000	$ 3,000	$ 3,000
Construction Reports	$ 4,500	$ 4,500	$ 4,500
			SUBTOTAL $ 7,500

LABOR

Classification	Pay Unit	Hourly Rate	Hours	Workers	Extension
Professional Labor - Construction Management					
Sr. Construction Manager (Office)	per hour	$ 119.91	7	1	$ 791
Administrator (Office)	per hour	$ 53.29	5	1	$ 264
Superintendent	per hour	$ 98.78	13	1	$ 1,304
SSHO/CQC	per hour	$ 90.78	7	1	$ 599
Local Craft DB Labor					
Operator Gp 1	per hour	$ 74.45	3	2	$ 447
Operator Gp 1 OT	per hour	$ 99.81	2	2	$ 299
Labor Gp 1	per hour	$ 65.59	24	2	$ 3,148
Labor Gp 1 OT	per hour	$ 85.89	12	2	$ 2,061
Environmental Field Support					
Mid Level Environmental Scientist	per hour	$ 90.00	26	1	$ 2,376
				SUBTOTAL	$ 11,290

EQUIPMENT

ITEM	Units	Unit	Rate	Quantity	Extension
Crew / tools transport (6 wheeler)	1	Month	$ 2,500	0.1	$ 167
End Dump (12 CY Capacity)	1	Day	$ 350	1	$ 350
Excavator, CAT 312 equivalent	1	Day	$ 460	1	$ 460
				SUBTOTAL	$ 977

MATERIALS

ITEM	Description	Unit	Rate	Quantity	Extension
Misc Supplies	Lump Sum	1	$ 250	1	$ 250
Warning Signs	signs	each	$ 119	4	$ 477
Chain-link fencing materials	20 feet	LS	$ 500	2	$ 1,000
Connections, hardware for signs	hardware	LS	$ 75	4	$ 300
Quikrete - 40 lb bag (1/3 cu.ft / bag)	bag	bag	$ 10	12	$ 120
Fuel (4.4 gal/hr)	Diesel/gas	Gallon	$ 4.50	42	$ 190
				SUBTOTAL	$ 2,337

OTHER DIRECT COSTS

ITEM	Description	Unit	Rate	Quantity	Extension
Communication (on site, long distance, etc)	COMMS	minute	$ 1.50	120	$ 180
Per Diem	Per Diem	manday	$ 140	20	$ 2,800
PPE/Safety	PPE/Safety	manday	$ 15	20	$ 300
				SUBTOTAL	$ 3,280

Monitoring and Maintenance (30 Years)

LABOR

Classification	Pay Unit	Hourly Rate	Hours per Year	Personnel	Extension
Labor - Monitoring and Maintenance (1st Event Performed 5 Years after Capping - 10% cost escalation)					
Perform visual inspections and minor maintenance; prepare inspection reports. Amini	per hour	$ 99.00	45	1	$ 4,455
					SUBTOTAL $ 4,455

OTHER DIRECT COSTS - 1st Event Performed 5 Years after Capping - 10% cost escalation

ITEM	Description	Unit	Rate	Quantity	Extension
Travel (Anchorage to Lake Louise)	RT	mile	$ 0.56	570	$ 320
Misc. Supplies	general	LS	$ 60	1	$ 60
Per diem	per diem	manday	$ 154	2	$ 308
					SUBTOTAL $ 688

Monitoring and Maintenance - Year 10 (2nd Event)	SUBTOTAL	$ 6,269
Monitoring and Maintenance - Year 15 (3rd Event)	SUBTOTAL	$ 6,921
Monitoring and Maintenance - Year 20 (4th Event)	SUBTOTAL	$ 7,642
Monitoring and Maintenance - Year 25 (5th Event)	SUBTOTAL	$ 8,437
Monitoring and Maintenance - Year 30 (6th Event)	SUBTOTAL	$ 9,315

COST SUMMARY

Cost		$	69,112
Project Management (PM)	10.0%	$	6,911
G&A on non-labor costs	10.0%	$	1,244
Subtotal		**$**	**77,267**
Profit	8.0%	$	6,181
Cost Escalation	0.0%	$	-
Labor rates include G&A	**TOTAL**	**$**	**83,449**
PM is % of cost	**Cost per Ton**	**$**	**25,756**

Cost Escalation applied to Subtotal and Profit

SUBTOTALS

LABOR	$	56,670
EQUIPMENT	$	977
MATERIALS	$	2,337
ODC	$	9,128
SUBCONTRACT	$	-
SUBTOTAL	**$**	**69,112**

SUBTOTALS - Institutional Controls

Installation	$	30,869
30-Year Monitoring and Maintenance	$	52,580
Average Monitoring and Maintenance Costs per Year	$	1,753

Assumptions:
It is assumed the equipment and personnel are already onsite for other work (no mobilization or demobilization included for construction phase). A 2-foot gravel cap will be placed over the contaminated soil in each location with the use of an excavator and an operator, taking an estimated 2 hours each. It is assumed gravel can be scavenged from nearby gravel sources with little to no hauling distance. It also assumes the UST and leachfield excavation is already fillled in. Institutional controls (fencing and signage) will be installed by two laborers over the course of two days. Monitoring every 5 years was estimated for 30 years with a 2% per year compounding cost escalation. The routine maintenance will consist of securing and repairing fencing and signs. The inspection reports will be brief and consist of a checklist of items. The estimate includes travel for a professional from Anchorage to perform the site inspections and reporting.

Appendix B, Table B-3
Lake Louise Cost Estimating Worksheets: PCB-Contaminated Soil Alternatives

Table B-3b: Excavation and Offsite Disposal in the Contiguous U.S. of BaP-Contaminated Soil

Description:
This scenario involves the cost to excavate and transport BaP-contaminated soil from LLRC out of Alaska for disposal in the lower 48 states. Two locations will be excavated, dining hall and shower area. An estimated 1 yd^3 (1.6 tons) of excavated soil will be removed in each area. Confirmation soil samples will be collected following excavation. The soil will be placed into 1 yd^3 super sacks and driven to Anchorage, Alaska. The soil will be then be shipped to Oregon for disposal.

Planning and Reporting (Documentation Labor)

Classification	Lump Sum Cost	Subtotal	Extension
Professional Labor			
Plan (for removal action)	$2,500	$ 2,500	$ 2,500
Report	$6,500	$ 6,500	$ 6,500
			SUBTOTAL $ 9,000

Classification	Pay Unit	Hourly Rate	Hours	Workers	Extension
Professional Labor - Construction Management					
Sr. Construction Manager (Office)	per hour	$ 119.91	4	1	$ 480
Administrator (Office)	per hour	$ 53.29	4	1	$ 213
Superintendent	per hour	$ 98.78	9	1	$ 889
SSHO/CQC	per hour	$ 90.78	5	1	$ 409
Local Craft DB Labor (Containerization and Shipping)					
Operator Gp 1	per hour	$ 74.45	12	2	$ 1,787
Operator Gp 1 OT	per hour	$ 99.81	6	2	$ 1,198
Labor Gp 1	per hour	$ 65.59	12	1	$ 787
Labor Gp 1 OT	per hour	$ 85.89	6	1	$ 515
Environmental Field Support					
Mid Level Environmental Scientist	per hour	$ 90.00	12	1	$ 1,080
				SUBTOTAL	$ 7,357

EQUIPMENT

ITEM	Units	Unit	Rate	Quantity	Extension
Excavator, CAT 312 equivalent	1	Day	$ 460	2	$ 920
End Dump (12 CY Capacity)	1	Day	$ 350	2	$ 700
Crew / tools transport (6 wheeler)	1	Month	$ 2,500	0.1	$ 250
				SUBTOTAL	$ 1,870

MATERIALS/CONSUMABLES

ITEM	Description	Unit	Rate	Quantity	Extension
Fuel (4.4 gal/hr)	Diesel/gas	Gallon	$ 4.50	27	$ 122
Super sacks (1 CY), with 3 mil HDPE liner	Containers	ea	$ 18.24	3	$ 55
				SUBTOTAL	$ 176

OTHER DIRECT COSTS

ITEM	Description	Unit	Rate	Quantity	Extension
Communication (on site, long distance, etc)	COMMS	minute	$ 1.50	60	$ 90
PPE/Safety, and misc supplies.	PPE/Safety	manday	$ 30	10	$ 300
Per diem	per diem	manday	$ 140	10	$ 1,400
				SUBTOTAL	$ 1,790

SUBCONTRACTORS

COMPANY	Description	Unit	Rate	Quantity	Extension
Lab analysis (PAH in soil)	lab analysis	each	$ 175	8	$ 1,400
Transport and disposal of soil to Columbia Ridge, Oregon	transport/disposal	LS	$ 800	2	$ 1,600
				SUBTOTAL	$ 3,000

SUBTOTALS	
LABOR	$ 16,357
EQUIPMENT	$ 1,870
MATERIALS	$ 176
ODC	$ 1,790
SUBCONTRACT	$ 3,000
TOTAL	$ 23,194

COST SUMMARY

Cost		$	23,194
Project Management (PM)	10.0%	$	2,319
G&A on non-labor costs	10.0%	$	684
Subtotal		**$**	**26,197**
Profit	8.0%	$	2,096
Cost Escalation	0.0%	$	-
Labor rates include G&A	**TOTAL**	**$**	**28,292**
PM is % of cost	**Cost per Ton**	**$**	**8,841**

Cost Escalation applied to Subtotal and Profit

Assumptions
It is assumed the equipment and personnel are already onsite for other work (no mobilization or demobilization included in construction phase). Excavation, super sack filling, and backfilling will take an estimated 0.75 days to complete at each area. Backfill material is assumed to be available in the immediate vicinity at no additional cost. Following excavation, 2 soil samples will be collected and analyzed for PAHs based on ADEC guidance of 2 samples for the first 250 square feet of excavation, plus a duplicate sample and one contingency. Time and materials to backfill the entire, original, UST and leach field excavations not included because that would occur regardless of contaminated soil removal. The subject contaminated soil is not a RCRA waste but disposal subject to the Offsite rule.

Table B-3c. Labor Buildup

Professional Labor Buildup (2011)		
	Pay Unit	Hourly Billing Rate
Construction Manager	per hour	$ 119.91
Administrator	per hour	$ 53.29
Site Superintendent	per hour	$ 98.78
SSHO/CQC	per hour	$ 90.78
Scientist - Entry (Field Support)	per hour	$ 70.00
Regulatory Specialist (Waste Coordinator)	per hour	$ 124.02
Midlevel Environmental Scientist	per hour	$ 90.00

Craft Labor Buildup (2011)						
	Pay Unit	Hourly Pay	Fringe	Subtotal	G&A and Profit	Hourly Billing Rate
					40.00%	
Operator Gp 1	per hour	$ 36.23	$ 16.95	$ 53.18	$ 21.27	$ 74.45
Operator Gp 1 OT	per hour	$ 54.35	$ 16.95	$ 71.30	$ 28.52	$ 99.81
Labor Gp 1	per hour	$ 29.00	$ 17.85	$ 46.85	$ 18.74	$ 65.59
Labor Gp 1 OT	per hour	$ 43.50	$ 17.85	$ 61.35	$ 24.54	$ 85.89

General Notes:

1 - Professional labor rates are based on current market rates for the year 2011.

2 - Craft labor rates (Hourly pay and Fringe) are based on wage rates from General Decision Number: AK20100001 12/10/2010 AK1 (Davis Bacon). A 40% markup was applied to craft labor rates to cover labor burden and G&A.

Table B-3d: Unit Cost Summary
Lake Louise Supplemental FS for BaP

Item	Unit	Cost	Source
LABOR			
Professional Labor	Hour	Varies	Current market rates based on professional judgment and knowledge
Local Craft DB labor	Hour	Varies	General Decision Number: AK20100001 12/10/2010 AK1 (Davis Bacon)
EQUIPMENT			
Utility Vehicle, 6 wheeler, crew / tools transport	Month	$ 2,500	Based on 2009 rental costs for field work
End Dump (12 CY Capacity)	Day	$ 350	NC Machinery, Anchorage
Excavator, CAT 312 equivalent	Day	$ 460	NC Machinery, Anchorage
MATERIALS			
Fuel (4.4 gal/hr)	gallon	$ 4.50	Fuel cost based on 4/18/11 gas price in Glennallen.
Super sacks (1 CY), with 3 mil HDPE liner	ea	$ 18.24	BAGcorp, Inc.
Monitoring Work Plan	ea	$ 5,000	Engineer's estimate
Signage	ea	$ 119	Graphic Works (10-30-08)
Chain-link fencing materials	LS	$ 500	Home Depot
Connections, hardware for signs	ea	$ 75	Spenard Builders Supply
Quikrete - 40 lb bag (1/3 cu.ft / bag)	bag	$ 10	Spenard Builders Supply
OTHER DIRECT COSTS			
Communication (on site, long distance, etc)	minute	$ 1.50	Engineer's estimate
Per Diem	manday	$ 140	Lake Louise Lodge (4/18/2011)
PPE/Safety	manday	$ 15	Engineer's estimate
Travel (Anchorage to Lake Louise)	mile	$ 0.51	IRS Mileage Rate
SUBCONTRACTORS			
Transport and disposal of soil to Oregon	LS	$ 800	Ahtna Engineering Services, LLC
Lab analysis (PAH in soil)	each	$ 175	SGS Laboratory (Anchorage)