Libby Asbestos Superfund Site
Operable Unit (OU) 3
Lincoln County, Montana

Public Review Draft
Libby Amphibole Asbestos (LA)-Related Fire Preparedness
Engineering Evaluation/Cost Analysis (EE/CA)

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List of Acronyms and Abbreviations

ABS	activity-based sampling
amsl	above mean sea level
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DEQ	Montana Department of Environmental Quality
DNRC	Montana Department of Natural Resources and Conservation
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
FS	feasibility study
HEI	Hafferman Engineering, Inc.
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
KDC	Kootenai Development Company
KDID	Kootenai Development Impoundment Dam
LA	Libby amphibole asbestos
LRC	Lower Rainy Creek
MCL	maximum contaminant level
MCY	million cubic yards
MDST	Montana Department of State Lands
MFL	million fibers per liter
Ms/cm^2	million structures per square centimeter
Ms/g-dw	million structures per gram-dry weight
MWH	MWH Americas, Inc.
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	non-detect
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NTCRA	non-time critical removal action
OU	operable unit
PCME	phase contrast microscopy-equivalent
PL	Preparedness Level
PLM-VE	polarized light microscopy – visual area estimation
PPE	personal protective equipment
PRSC	post-removal site controls
QAPP	quality assurance project plan
RA	removal action alternative
RAO	removal action objective
RI	remedial investigation
RS	ranger station
s/cc	structures per centimeter
s/g, ww	structures per gram of tissue on a wet weight
SAP	sampling and analysis plan

Site	Libby Asbestos Superfund Site
TBC	to be considered
TCRA	time critical removal action
USDAFSR1	U.S. Department of Agriculture Forest Service Region 1
USFS	U.S. Forest Service
VW	vermiculite waste
µm	micrometer

Executive Summary

Introduction and Purpose

This engineering evaluation/cost analysis (EE/CA) report for the Operable Unit (OU) 3 of the Libby Asbestos Superfund Site (Site) was prepared jointly by U.S. Forest Service (USFS) and U.S. Environmental Protection Agency (EPA).

The EE/CA was prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (EPA 1993). In addition, the cost estimates for each removal action alternative were developed in accordance with *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000b).

This EE/CA was prepared to support the selection of an alternative for the implementation of a non-time-critical removal action (NTCRA) for the Libby OU3. For purposes of this EE/CA, the focus of the removal action is the following:

- Libby amphibole asbestos (LA) related fire preparedness activities – Refers to providing the resources to prepare for and to provide an aggressive initial response to a fire start in areas of OU3 with LA in forest-related source media that could pose unacceptable human health risk during and after a fire. Fire suppression, the actions taken once a fire start occurs and after the initial response, is outside the scope of this EE/CA.
- LA-related fire preparedness activities presented in this EE/CA are evaluated based on their abilities to achieve removal action objectives (RAOs) identified in Section 3.

The purpose of the EE/CA is to document the environmental review and removal action selection process and provide a framework for evaluating and selecting alternative technologies. The EE/CA identifies RAOs of the NTCRA and analyzes the effectiveness, implementability, and cost of removal action alternatives that may be used to satisfy the RAOs. The results of the EE/CA, along with USFS and EPA's response decision, will be summarized in an Action Memorandum after review and response to public comments on the EE/CA. Section 300.415 (b)(4)(i) of the NCP requires completion of an EE/CA for all NTCRAs.

This EE/CA is not a decision document on whether or not the USFS would engage in suppressing a fire in OU3. That decision is specific to each fire and will be determined by the agency on a case-by-case basis after thorough evaluation of all factors (e.g., public and firefighter safety, fire location, fire behavior, weather forecasts).

Site Location

Historical documents and investigations for OU3 have focused on the area described as the OU3 Study Area. As such, the background subsections below describe the site characteristics in the context of the OU3 Study Area. The permitted area of the Former Mine within the OU3 Study Area is within Sections 15, 21, 22, 23, 26, and 27 of Township 31 North, Range 30 West, Montana Principal Meridian (MWH Americas, Inc. [MWH] 2016). The Former Mine Area is located

northeast of Libby, Montana, approximately 5 miles along U.S. Highway 37 and 2 miles along Rainy Creek Road.

Site Background

Prospectors first located vermiculite deposits in the early 1900s on Rainy Creek northeast of Libby. Vermiculite was mined from the early 20th century to the early 1990s. The Zonolite Mine contains the single largest known deposit of vermiculite in the world. The vermiculite deposit at the mine also contains an assemblage of amphibole asbestos minerals, including (in order of decreasing abundance) winchite, richerite, and tremolite, with lower levels of magnesio-riebeckite, edenite, and magnesio-arfvedsonite (Meeker et al. 2003), which are referred to collectively as LA. Over time, vermiculite became a product used in insulation, feed additives, fertilizer/soil amendments, construction materials, absorbents, and packing materials. Many people used vermiculite products and off-specification materials for insulation in their houses in Libby and soil additives in their gardens. In 1963, Grace bought the former Libby Vermiculite Mine and associated processing facilities and operated them until 1990. Operations at the former Libby Vermiculite Mine included blast and drag-line mining and milling of the ore. Dry milling was done through 1985, and wet milling was done from 1985 until closure in 1990. Before the former Libby Vermiculite Mine closed in 1990, Libby produced approximately 80 percent of the world's supply of vermiculite.

Since 1999, EPA has been conducting response actions at the Site to address the unprecedented human health impacts associated with widespread contamination in and near the cities of Libby and Troy. In 2002, EPA listed the Site on the Superfund National Priorities List (NPL). The Site consists of eight OUs, including OU3, which is the subject of this EE/CA.

Site Features

The OU3 Study Area is defined as the property in and around the Former Mine Area owned by Grace or Grace-owned subsidiaries (excluding OU2, the Former Screening Plant) and any area (including any structure, soil, air, water, sediment, or receptor) impacted by the release and subsequent migration of hazardous substances and/or pollutants or contaminants from such property (see Figure 2-1). These areas include (but are not limited to) the Former Mine Area, former mill area, Kootenai Development Impoundment Dam (KDID) mine production created ponds, waste rock piles, tailing piles, the Kootenai River, Carney Creek, Fleetwood Creek, Rainy Creek, Rainy Creek Road, and areas in which tree bark is contaminated with such hazardous substances and/or pollutants and contaminants (MWH 2016).

Access to the OU3 Study Area is largely limited to USFS roads. These roads facilitate the ability of the USFS to respond to fires. In total, the OU3 Study Area includes approximately 76 miles of road.

The KDID was initially constructed in 1971 to store and manage tailing slurry generated from the wet processing of vermiculite. The tailing dam reaches a maximum structural height of 135 feet. The KDID has a crest width of about 40 feet, a crest length of about 1,040 feet, and a crest elevation of approximately 2,930 feet, with 2:1 (horizontal to vertical) upstream and downstream slopes. The KDID has a concrete principal spillway on the left abutment with a collared inlet invert at an elevation of approximately 2,905 feet above mean sea level (amsl). The principal spillway runs through a concrete box culvert beneath the embankment crest, down the left slope

(looking downstream) in an open channel culvert, and discharges into Rainy Creek downstream of the KDID. The emergency spillway is on the right abutment of the KDID and is an open channel with an invert elevation of approximately 2,927 feet amsl, sparsely lined with cobbles and boulders, and not known to have operated. There is no controlled outlet for the dam, and inflows are uncontrolled.

Kootenai Development Company (KDC), a subsidiary of Grace, owns approximately 3,600 acres of land that includes the Former Mine Area and the surrounding area to a distance of approximately 1 mile radially from the center of the Former Mine Area. The mining-disturbed area of the mine property is approximately 1,100 acres (MWH 2016). Land surrounding the KDC property within the OU3 Study Area is mainly within the Kootenai National Forest, which is managed by the USFS (approximately 22,000 acres). Approximately 640 acres of land parcels are owned by the State of Montana, 170 acres of land parcels are owned by the U.S. Army Corps of Engineers, and 2,600 acres of land parcels are owned by Weyerhaeuser Company for commercial logging (MWH 2016). Approximately 690 acres of land parcels are private (primarily residential) properties near the southern border of the OU3 Study Area and are included as part of OU4. The OU3 Study Area encompasses approximately 32,000 acres, which includes the above acreage values (excluding properties designated as OU4) and the Kootenai River (MWH 2016).

Previous Removal Actions at OU3

2012 and 2013 Removal Actions

The results of a field investigation conducted in October 2011 indicated that Rainy Creek flowed through an area containing vermiculite waste (VW) located below the area referred to as the Amphitheater, which is located to the southwest of the Mill Pond. The VW was originally removed in 1994, as part of mine reclamation, from the Carney Creek sediment pond, which is located to the southeast of the Mill Pond. The material had been spread over the Amphitheater area as a soil substitute and re-seeded in 1995 (Montana Department of State Lands [MDST] 1995). This area was a potential source of elevated LA levels detected in Lower Rainy Creek (LRC). The removal action was performed in two phases of work, fall of 2012 and summer of 2013. Waste thickness ranged from less than 1 inch near the margins to more than 5 feet in berms and piles on the area south of Rainy Creek (MWH 2016).

Approximately 15,600 cubic yards (1,344 truckloads) of vermiculite waste were removed from approximately 4 acres in an area near the amphitheater and transported along the haul road for final placement on top of the mine in Area 2. A total of 35,440 cubic yards (3,544 truckloads) of OU4 material were used as backfill for the excavations. The backfilled area was graded for drainage and was revegetated in the fall of 2013 (MWH 2013). Fifteen total 30-point composite characterization soil samples were collected following the 2012 and 2013 removal activities to confirm the removal action was complete.

2016 Removal Action

The EPA and USFS utilized a time critical removal action (TCRA) to authorize heightened fire preparedness actions during the 2016 fire season that would enable a more aggressive initial attack to wildland fires in OU3 to enhance fire suppression effectiveness. USFS historically funded one helicopter to be stationed on the Kootenai National Forest. That helicopter was not dedicated to OU3 or the Kootenai National Forest; thus, it had been dispatched to fires elsewhere in the U.S.

when necessary. Due to the priority and concern for fires starting in or near OU3, an additional helicopter was stationed in Libby during high fire preparedness levels (PLs) or as determined by fire managers to support aggressive initial attack on fire starts in OU3 as part of the 2016 TCRA. This helicopter was stationed in Libby so it could provide an immediate response to wildland fire starts in OU3. In addition to the helicopter, the TCRA included heavy equipment (dozer and lowboy) and a team of specially trained and equipped firefighters stationed in Libby to enhance fire protectiveness at OU3.

Human Health Risk Assessment

The *Final Site-Wide HHRA* (EPA 2015a) quantifies potential human health risks from exposure to LA at the OU3 Study Area. Cumulative risk calculations show that people who are predominantly exposed at locations with lower LA levels in source media are likely to have cumulative risks that are below a level of concern even when the cumulative scenario includes many different exposure activities across multiple OUs. Cumulative exposure and risk can be reduced by changing the locations where the activities are performed (e.g., collecting firewood from areas far from the mine site). Cumulative exposure has the potential to become significant if most receptor lifetime is spent at properties and in locations where LA is present and where people are engaging in source disturbance activities that have a high potential for LA releases. When cumulative exposure includes scenarios where LA-contaminated source materials are disturbed, such as trespassing on the disturbed area of the mine site or performing certain activities related to commercial logging operations near the mine site, these exposures may be important risk drivers for cumulative risk estimates. EPA defines a risk driver as an individual exposure scenario that contributes a substantial fraction of the cumulative risk. Addressing exposures for the risk drivers for each potential receptor will have the greatest impact in lowering cumulative exposures and risks (EPA 2015a).

To ensure protectiveness in consideration of cumulative exposures, an exposure scenario hazard quotient (HQ) value of 0.6 was identified as the threshold for identifying individual exposure scenarios that had the potential to contribute to unacceptable risks (MWH 2016). Of those exposure scenarios that relate to the OU3 Study Area, the following exposure scenarios had estimated HQs greater than or equal to 0.6 (MWH 2016):

- Outdoor worker exposures during commercial logging activities in OU3 near the mine, especially those logging activities that disturb soil and duff material (e.g., site restoration, skidding) (HQ=2 for site restoration; HQ=5 for skidding)
- Firefighter exposures during an understory burn that occurs near the mine (HQ=0.7) and while performing mop-up activities following the understory burn (HQ=5 during dry mop-up and HQ=1 during wet mop-up)
- Forest worker exposures while building slash piles near the mine (HQ=2)
- Trespasser rock hound exposures in the disturbed area of the mine in OU3 (HQ=2)
- Residential exposures while emptying ash from the woodstove when firewood is collected from near the mine (HQ=2)
- Recreational visitor exposures while hiking along lower Rainy Creek (HQ=0.6)

Determination of Removal Action Scope

The general objective of a removal action, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the NCP, is to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release of hazardous substances or pollutants or contaminants to the environment. The scope of the EE/CA is limited to LA-related fire preparedness activities for USFS and contractor personnel in OU3, and the goal of the NTCRA is to minimize the potential for a wildland fire and the corresponding risks from LA liberated from source media. In particular, this includes risk of exposure to firefighters, risks from migration of LA-contaminated ash to waterways, and risks of release of LA-contaminated tailings from the failure of the KDID. This action is considered an interim action because it is expected that the remedial action for OU3 ultimately will address the remaining risks from LA contamination.

The following activities are included in the scope of this EE/CA as it relates to LA-related fire preparedness:

- The stationing of OU3-dedicated equipment and personnel at Libby
- Asbestos-related exposure training for OU3-dedicated personnel
- The procurement and fitting of personal protective equipment (PPE) and the procurement of any decontamination units required for OU3-dedicated equipment and personnel at Libby

The scope of this EE/CA does not include 'on the ground' firefighting activities, including initial response to fires and fire suppression. As such, the alternatives would include any LA-related fire preparedness measures up to the point at which 'on the ground' activities would be required for response to a fire start. However, the alternative analysis does evaluate the consequences from LA preparedness on achievement of the RAOs during fire response. For instance, exposure risks to firefighters are evaluated because differing levels of LA-related fire preparedness may ultimately result in differing exposure risk outcomes during fire response and suppression and thus differing consequences of the actions taken under the alternatives. Similarly, the potential for releases of LA from forest-related source media and the tailings impoundment behind the KDID also are evaluated as outcomes from differing levels of LA fire preparedness.

The geographic scope of this NTCRA, referred to herein as the "OU3 removal action area," is delineated by the OU3 FS Boundary used for the remedial process for OU3. The OU3 FS Boundary, which represents a portion of the larger OU3 Study Area, is shown on Figure 2-1. The OU3 FS Boundary was delineated primarily by the location of areas where unacceptable risks from exposures to LA-contaminated duff/soil have been shown and considers information on measured LA concentrations in duff and soil, air modeling, and site topography. KDC owns approximately 3,600 acres of land within the OU3 removal action area, which includes the Former Mine Area. Land surrounding the KDC property within the OU3 removal action is mainly within the Kootenai National Forest, which is managed by the USFS (approximately 5,400 acres). Approximately 640 acres of land parcels are owned by the State of Montana, 350 acres of land parcels are owned by Weyerhaeuser Company for commercial logging, and approximately 70 acres of other private land parcels. The OU3 removal action area encompasses approximately 10,000 acres, which includes the above acreage values.

Removal Action Objectives

The following RAOs have been identified for this EE/CA:

1. Reduce the exposure of firefighters to LA released from forest-related source media during and after a wildland fire.
    - Rationale: The HHRA identified unacceptable risks to firefighters from exposure to LA during an understory burn and while performing post-fire mop-up (both wet and dry).
2. Reduce generation of LA-contaminated wildfire ash from existing forest-related source media that could result in the contamination of nearby drinking water resources.
    - Rationale: Following wildland fires, the post-fire ash containing LA in burned areas is susceptible to transport by erosion and runoff after precipitation events, increasing the potential for migration of LA to nearby surface water bodies. Migration of LA to nearby surface water bodies could threaten potential drinking water supplies.
3. Reduce the probability of a release of LA-contaminated tailings from a failure of the KDID resulting from increased post-fire runoff of precipitation and erosion of sediment into the tailings impoundment that the currently damaged spillway of the KDID would not be able to accommodate.
    - Rationale: Large post-fire precipitation events, resulting in water and sediment loading behind the dam, could cause the principal spillway to fail, thereby potentially releasing large amounts of LA-contaminated tailings into Rainy Creek and downstream water supplies on the Kootenai River.

Identification and Description of Removal Action Alternatives

The following removal action alternatives were identified for evaluation in this EE/CA:

- Removal Action Alternative (RA) 1: No LA-Related Fire Preparedness Activities
- RA2: LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support
- RA3: LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

A brief description of each removal action alternative is presented in the following subsections.

Alternative RA1: No LA-Related Fire Preparedness Activities

Alternative RA1 assumes that standard USFS fire preparedness activities would be followed in the OU3 removal action area with no added LA-related fire preparedness activities being conducted. Alternative RA1 would not include OU3-dedicated aerial or ground resources based in Libby such as helicopters, specially trained firefighting crews, and dozers. Fires that start within the OU3 removal action area would be addressed based on standard USFS prioritization structures and resource availability. Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. This standard response would include fire starts within the OU3 removal action area where human health risks from forest-related source media

containing LA, such as duff, are the highest as illustrated in Figure 2-1, thus, exposing firefighters to elevated LA exposure risks.

Alternative RA2: LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support

Alternative RA2 includes LA-related fire preparedness through increased firefighting resources based in Libby, including OU3 aerial resources with a limited dedicated ground crew to support the aerial response. These aerial resources would allow for an aggressive initial aerial attack on new fire starts within the OU3 removal action area. Normal fire preparedness activities would continue for fire starts outside the OU3 removal action area and are not evaluated in this EE/CA. Fire response, including the initial response to fires and fire suppression, is not addressed in this alternative and is outside the scope of this EE/CA.

For the purposes of this EE/CA, it is assumed that the period of analysis for this alternative would be a minimum of 3 years. This alternative would include added resources, above and beyond normal fire preparedness resources. Thus, additional expenses would be incurred for stationing of increased fire-related resources at Libby for heightened LA-related fire preparedness.

Alternative RA3: LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

Alternative RA3 includes heightened LA-related fire preparedness through increased firefighting resources, including OU3 aerial resources and ground crew support. These dedicated aerial and ground crews would allow for an aggressive initial attack on new fire starts within the OU3 removal action area. Normal fire preparedness activities would continue for fire starts outside the OU3 removal action area and are not evaluated in this EE/CA. Fire response, including the initial response to fires and fire suppression, is not addressed in this alternative and is outside the scope of this EE/CA.

For the purposes of this EE/CA, it is assumed that the period of analysis for this alternative would be a minimum of 3 years. Additionally, this alternative would include added resources, above and beyond normal fire preparedness resources.

Detailed Analysis and Comparative Analysis of Removal Action Alternatives

These removal action alternatives are evaluated and compared using the criteria specified in EPA's *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (EPA 1993). This EE/CA evaluates the three removal action alternatives against the short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost as well their sub-criteria. The results of the detailed analysis for each removal action alternative are presented in Exhibit ES-1 to allow a comparative analysis of the alternatives and identify the key tradeoffs between them as presented in the EE/CA.

Recommended Removal Action Alternative

Taking into consideration the evaluation criteria presented in this EE/CA, the recommended removal action alternative for the Libby OU3 EE/CA is Alternative RA3: LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support. Alternative RA3 includes heightened LA-related fire preparedness through increased firefighting resources, including OU3 aerial resources and dedicated ground crew support. The dedicated aerial resources and ground crew would provide the necessary resources to enable an aggressive initial attack on new fire starts within the OU3 removal action area.

Alternative RA1 assumes that standard USFS fire preparedness activities would be followed in OU3 with no added LA-related fire preparedness activities being conducted. It does not provide adequate protection of human health and the environment and has the lowest effectiveness. Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. Thus, Alternative RA1 would not meet RAO1 as the alternative would result in firefighters exposed to unacceptable risks within the OU3 removal action area. Additionally, RA1 may not be able to meet RAOs 2 and 3 because standard firefighting resources may not be available at the time a fire starts in the OU3 removal action area because they are not stationed in Libby. If a wildland fire does occur, the ground in burned areas is susceptible to transport by erosion and surface water runoff after precipitation events, thus, increasing the potential for migration of LA-contaminated ash to nearby surface waters that are potential drinking water supplies. Additionally, those areas are susceptible to high-flow runoff events that could increase the risk of failure from the currently damaged spillway at the KDID.

Alternative RA2 provides an added level of protection over Alternative RA1 through the inclusion of OU3 aerial resources and a limited ground crew. Unlike Alternative RA1, Alternative RA2 would address the RAOs through heightened LA-related fire preparedness; however, there is some uncertainty about the extent of reductions achieved for RAOs 2 and 3 due to the limitations of an aerial approach with limited ground support. Limitations of Alternative RA2 include the potential inability to extinguish fire starts due to the absence of a full ground crew.

Alternative RA3 utilizes aerial support in combination with a ground crew to provide the most effective and reliable tactic to prevent a fire start from becoming a wildland fire and minimize burn severity. Under this alternative, LA-contaminated wildland fire ash would be minimized because heightened LA-related fire preparedness would provide the resources to reduce the size and spreading of wildland fires within the OU3 removal action area. Reducing the size and spread of wildland fires also would reduce the amount of burned areas that are susceptible to transport by erosion and surface water runoff after precipitation events, thus, reducing the potential for migration of LA-contaminated ash to nearby surface waters that are potential drinking water supplies. In addition, it would reduce the likelihood of a release of LA-contaminated tailings as a result of a potential failure of the KDID. Due to a reduced burned area, there would be less susceptibility to high-flow runoff events that could result in increased post-fire runoff and erosion of sediment into the KDID and risk of failure from the currently damaged spillway at the KDID. Alternative RA3 provides the most effective measures to address the three RAOs and would provide adequate protection for human health and the environment.

Alternative RA3 has higher long-term effectiveness and permanence and short-term effectiveness than Alternative RA2. Technical feasibility, administrative feasibility, and availability of services are not significantly different between Alternatives RA2 and RA3. Alternative RA1, which involves standard USFS fire preparedness activities, does not provide for overall protection of human health and has the lowest effectiveness. While the difference between costs for Alternatives RA2 and RA3 is significant, the added level of overall effectiveness based on "long-term effectiveness and permanence" and "short-term effectiveness" for Alternative RA3 over Alternative RA2 (Exhibit ES-1) would make Alternative RA3 the recommended alternative.

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Exhibit ES-1. Summary of Comparative Analysis for Removal Action Alternatives

Removal Action Alternative	Description	Effectiveness					Implementability					Cost	
		Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Technical Feasibility	Administrative Feasibility	Availability of Services and Materials	State (Support Agency) Acceptance	Community Acceptance	Present Value Cost (Dollars)	
RA1	No LA-Related Fire Preparedness Activities	Unacceptable	Acceptable	Low	None	Low	High	High	Moderate	**NE**	**NE**	None	$0
RA2	LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support	Acceptable	Acceptable	Moderate	None	Moderate	Moderate to High	Moderate	Moderate to High	**NE**	**NE**	Moderate to High	$5,709,000
RA3	LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support	Acceptable	Acceptable	Moderate to High	None	Moderate to High	Moderate to High	Moderate	Moderate to High	**NE**	**NE**	High	$7,781,000

Notes

1. The numerical designations for the qualitative ratings system used in this table are not used to quantitatively assess removal action alternatives (for instance, individual rankings for an alternative are not additive).
2. Detailed cost spreadsheets (cost summaries, present value analyses, and cost worksheets) for each alternative are presented in Appendix B.
3. Costs are based on a 3-year period of analysis.

Legend for Qualitative Ratings System:

Effectiveness and Implementability		Cost
For First Two Criteria	**For Rest of the Criteria**	**Present Value Cost in Dollars**
Unacceptable	**None**	**None**
Acceptable	**Low**	**Low ($0 through $1.5M)**
	Low to Moderate	**Low to Moderate ($1.5M through $3M)**
	Moderate	**Moderate ($3M through $4.5M)**
	Moderate to High	**Moderate to High ($4.5M through $6M)**
	High	**High (Greater than $6M)**
	NE (Not Evaluated)	

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Section 1
Introduction

This engineering evaluation/cost analysis (EE/CA) report for the Operable Unit (OU) 3 of the Libby Asbestos Superfund Site (Site) was prepared jointly by U.S. Forest Service (USFS) and U.S. Environmental Protection Agency (EPA).

The EE/CA was prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (EPA 1993). In addition, the cost estimates for each removal action alternative were developed in accordance with *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000b).

1.1 Purpose

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- Libby amphibole asbestos (LA) related fire preparedness activities – Refers to providing the resources to prepare for and to provide an aggressive initial response to a fire start in areas of OU3 with LA in forest-related source media that could pose unacceptable human health risk during and after a fire. Fire suppression, the actions taken once a fire start occurs and after the initial response, is outside the scope of this EE/CA.
- LA-related fire preparedness activities presented in this EE/CA are evaluated based on their abilities to achieve removal action objectives (RAOs) identified in Section 3.

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This EE/CA is not a decision document on whether or not the USFS would engage in suppressing a fire in OU3. That decision is specific to each fire and will be determined by the agency on a case-by-case basis after thorough evaluation of all factors (e.g., public and firefighter safety, fire location, fire behavior, weather forecasts).

1.2 EE/CA Organization

The EE/CA is organized as follows:

- **Section 2, Site Characterization** – Summarizes site characterization and presents the nature and extent of contamination associated with the NTCRA.
- **Section 3, Removal Action Scope, Goals, and Objectives** – Presents the removal scope, schedule, and RAOs for the NTCRA.
- **Section 4, Identification and Analysis of Removal Action Alternatives** – Identifies removal action alternatives that may be used to satisfy the RAOs and evaluate the effectiveness, implementability, and cost.
- **Section 5, Comparative Analysis of Removal Action Alternatives** – Conducts a comparative analysis of removal action alternatives to each other with respect to effectiveness, implementability, and cost.
- **Section 6, Recommended Removal Action Alternative** – Recommends the removal action alternative that best meets the evaluation criteria.
- **Section 7, References** – Presents a list of sources used in the preparation of the EE/CA.

Section 2
Site Characterization

Historical documents and investigations for OU3 have focused on the area described as the OU3 Study Area. As such, this section describes the site characteristics in the context of the OU3 Study Area.

2.1 Site Location

The permitted area of the Former Mine within the OU3 Study Area is within Sections 15, 21, 22, 23, 26, and 27 of Township 31 North, Range 30 West, Montana Principal Meridian (MWH Americas, Inc. [MWH] 2016). The Former Mine Area is located northeast of Libby, Montana, approximately 5 miles along U.S. Highway 37 and 2 miles along Rainy Creek Road.

2.2 Site Background

Prospectors first located vermiculite deposits in the early 1900s on Rainy Creek northeast of Libby. Vermiculite was mined from the early 20th century to the early 1990s. The Zonolite Mine contains the single largest known deposit of vermiculite in the world. The vermiculite deposit at the mine also contains an assemblage of amphibole asbestos minerals, including (in order of decreasing abundance) winchite, richerite, and tremolite, with lower levels of magnesio-riebeckite, edenite, and magnesio-arfvedsonite (Meeker et al. 2003), which are referred to collectively as LA. Over time, vermiculite became a product used in insulation, feed additives, fertilizer/soil amendments, construction materials, absorbents, and packing materials. Many people used vermiculite products and off-specification materials for insulation in their houses in Libby and soil additives in their gardens. In 1963, Grace bought the former Libby Vermiculite Mine and associated processing facilities and operated them until 1990. Operations at the former Libby Vermiculite Mine included blast and drag-line mining and milling of the ore. Dry milling was done through 1985, and wet milling was done from 1985 until closure in 1990. Before the former Libby Vermiculite Mine closed in 1990, Libby produced approximately 80 percent of the world's supply of vermiculite.

Since 1999, EPA has been conducting response actions at the Site to address the unprecedented human health impacts associated with widespread contamination in and near the cities of Libby and Troy. In 2002, EPA listed the Site on the Superfund National Priorities List (NPL). The Site consists of eight OUs, including OU3, which is the subject of this EE/CA.

2.3 Site Topography and Setting

The OU3 Study Area is generally hilly and comprised of several drainages. Elevations in the OU3 Study Area range from 2,080 feet above mean sea level (amsl) at the mouth of Rainy Creek to 6,040 feet amsl at Blue Mountain. The highest point within the mine-disturbed area is 4,204 feet amsl (MWH 2016). The ore body is expressed as an outcrop dome that is rimmed with Precambrian Belt Supergroup meta-sedimentary rocks. The rim is from 400 to 900 feet above the top of the mine. The dome is drained by Fleetwood Creek around the north perimeter of the mine and by Carney Creek around the south perimeter. These creeks are tributaries to Rainy Creek, a

larger stream that heads at an elevation of approximately 5,000 feet amsl on the slope of Blue Mountain (MWH 2016).

The Former Mine Area is disturbed by past mining activity, and some areas remain sparsely or non-vegetated (MWH 2016). Outside the Former Mine Area, only 4 percent of the land within the OU3 Study Area is classified as non-vegetated, with the remaining land area forested (U.S. Department of Agriculture Forest Service Region 1 [USDAFSR1] 2008).

2.4 Site Features

The OU3 Study Area is defined as the property in and around the Former Mine Area owned by Grace or Grace-owned subsidiaries (excluding OU2, the Former Screening Plant) and any area (including any structure, soil, air, water, sediment, or receptor) impacted by the release and subsequent migration of hazardous substances and/or pollutants or contaminants from such property (see Figure 2-1). These areas include (but are not limited to) the Former Mine Area, former mill area, Kootenai Development Impoundment Dam (KDID) mine production created ponds, waste rock piles, tailing piles, the Kootenai River, Carney Creek, Fleetwood Creek, Rainy Creek, Rainy Creek Road, and areas in which tree bark is contaminated with such hazardous substances and/or pollutants and contaminants (MWH 2016).

Access to the OU3 Study Area is largely limited to USFS roads. These roads facilitate the ability of the USFS to respond to fires. In total, the OU3 Study Area includes approximately 76 miles of road.

The KDID was initially constructed in 1971 to store and manage tailing slurry generated from the wet processing of vermiculite. The tailing dam reaches a maximum structural height of 135 feet. The KDID has a crest width of about 40 feet, a crest length of about 1,040 feet, and a crest elevation of approximately 2,930 feet, with 2:1 (horizontal to vertical) upstream and downstream slopes. The KDID has a concrete principal spillway on the left abutment with a collared inlet invert at an elevation of approximately 2,905 feet amsl. The principal spillway runs through a concrete box culvert beneath the embankment crest, down the left slope (looking downstream) in an open channel culvert, and discharges into Rainy Creek downstream of the KDID. The emergency spillway is on the right abutment of the KDID and is an open channel with an invert elevation of approximately 2,927 feet amsl, sparsely lined with cobbles and boulders, and not known to have operated. There is no controlled outlet for the dam, and inflows are uncontrolled.

Kootenai Development Company (KDC), a subsidiary of Grace, owns approximately 3,600 acres of land that includes the Former Mine Area and the surrounding area to a distance of approximately 1 mile radially from the center of the Former Mine Area. The mining-disturbed area of the mine property is approximately 1,100 acres (MWH 2016). Land surrounding the KDC property within the OU3 Study Area is mainly within the Kootenai National Forest, which is managed by the USFS (approximately 22,000 acres). Approximately 640 acres of land parcels are owned by the State of Montana, 170 acres of land parcels are owned by the U.S. Army Corps of Engineers, and 2,600 acres of land parcels are owned by Weyerhaeuser Company for commercial logging (MWH 2016). Approximately 690 acres of land parcels are private (primarily residential) properties near the southern border of the OU3 Study Area and are included as part of OU4. The OU3 Study Area encompasses approximately 32,000 acres, which includes the above acreage values (excluding properties designated as OU4) and the Kootenai River (MWH 2016).

2.5 Climate

Precipitation and temperature were evaluated by long-term precipitation data collected from USFS Libby 1 NE Ranger Station (RS). The station is located approximately 4 miles downstream from the confluence of Rainy Creek and the Kootenai River at an elevation of 2,100 feet amsl. Climate data for the USFS Libby 1 NE RS for the period of 1981 through 2010 is published online by the National Oceanic and Atmospheric Administration (NOAA 2016). Average minimum and maximum temperatures in the summer were 46.9 and 84.7 degrees Fahrenheit (°F), respectively, and in the winter were 21.6 and 35.3°F, respectively. The average annual precipitation for the 1981 through 2010 time period was 18.40 inches (NOAA 2016). November through December are typically the wettest months of the year, and August and September are typically the driest months of the year (MWH 2016). The predominant wind direction within the OU3 Study Area blows from southeast to northeast, as measured by an onsite weather station (MWH 2016).

2.6 Surface Water

Not all of the OU3 Study Area falls within the Rainy Creek watershed; however, primary surface water bodies in the Former Mine Area are located within the Rainy Creek watershed. The Rainy Creek Watershed is an area of approximately 17.8 square miles (MWH 2016). The primary surface water bodies include:

- **Rainy Creek** – Originates at an elevation of 5,000 feet amsl between Blue Mountain and the north fork of Jackson Creek until an elevation of approximately 2,080 feet amsl at the confluence with the Kootenai River. Rainy Creek is a perennial creek that supports a variety of fish and aquatic invertebrates (MWH 2016).
- **Fleetwood Creek** – Originates from the mountains on the east side of the Former Mine Area at an elevation of approximately 4,200 feet amsl, flows west along the northern edge of the Former Mine Area to the tailings impoundment at an elevation of 2,800 feet amsl, then flows into Rainy Creek. Fleetwood Creek is a perennial creek that supports a variety of fish and aquatic invertebrates, with the exception of 1/2 mile of the creek, which flows through coarse tailings and is devoid of vegetation and habitat (MWH 2016).
- **Carney Creek** – Originates from the mountains on the southeast side of the Former Mine Area at an elevation of approximately 4,400 feet amsl, flows west along the southern edge of the Former Mine Area, and then flows into Rainy Creek approximately 3,000 feet below the tailings impoundment at an elevation of approximately 2,700 feet amsl. Carney Creek is a perennial creek that supports a variety of fish and aquatic invertebrates (MWH 2016).
- **Kootenai River** – Flows from the southeast to northwest along the south side of the OU3 Study Area into Lake Koocanusa. Lake Koocanusa, formed after the construction of the Libby Dam (MWH 2016).

In addition to these primary surface water bodies, there are also several ponds within the Former Mine Area. The larger ponds were sampled as part of the remedial investigation (RI) and include:

- **Carney Pond** – Approximately 2 acres in size, the pond was formed when waste rock filled the Carney Creek drainage and blocked the creek (MWH 2016).

- **Fleetwood Pond** – Less than 1 acre in size, the pond was created when coarse tailings filled the bottom of the Fleetwood Creek drainage channel. Fleetwood Pond becomes dry in late summer (MWH 2016).
- **Tailings Impoundment** – The KDID was constructed to store fine tailings slurry produced by the vermiculite wet mill process. It covers an area of approximately 70 acres and receives flow from both Rainy Creek and Fleetwood Creek (MWH 2016).
- **Mill Pond** – Located approximately 1/2 mile downstream of the Kootenai Development Impoundment Dam, an earthen berm across Rainy Creek was constructed to supply reuse water for milling operations at the mine (MWH 2016).

2.7 Spillway Conditions at the KDID

As described in Section 2.4, the KDID was constructed to provide an impoundment for seepage water and fine tailings from the milling process. Water from the principal spillway discharges into Rainy Creek downstream of the KDID. Recent investigations have indicated that potential failure risks exist for the spillways at the KDID. Failure and dam breach could result in release of tailings and flood water to Rainy Creek and the Kootenai River.

During a routine inspection in 2016, it was noted that cracks had developed in the ceiling of the principal spillway box culvert and there was water dripping from the cracks and transverse joints. Based on these observations, an assessment was conducted on the principal spillway box culvert at the KDID in 2016. This assessment determined that the box culvert is not structurally adequate and is experiencing structural failure. It was recommended that the box culvert structure be replaced due to the risk of a failure of the box culvert when passing water and the potential for breach of the embankment of the dam (Hafferman Engineering, Inc. [HEI] 2016). There are also potential failure risks from the auxiliary (emergency) spillway, including erosion of the partially unlined auxiliary spillway and dam breach (MWH 2017). For both spillways, failure and dam breach would result in release of tailings and flood water to Rainy Creek. As such, a new service spillway is planned for replacement of both existing spillways by spring 2019 (MWH 2017).

While the new service spillway would be expected to provide a long-term solution to the dam safety concerns, additional short-term actions were evaluated in the Draft KDID Spillway Risk Assessment (MWH 2017). Based on the results of the Draft KDID Spillway Risk Assessment, construction of a cofferdam structure in front of the principal spillway was recommended to alleviate risk of failure of the current spillway until the expected completion of the new spillway in 2019. In addition, the Montana Department of Natural Resources and Conservation [DNRC] has expressed support for aggressive suppression of wildland fires in OU3 as wildfires could change runoff conditions, elevating the risk of future dam failure due to clogging of the principal spillway and subsequent overtopping of the dam.

2.8 Previous Removal Actions at OU3

2012 and 2013 Removal Actions

The results of a field investigation conducted in October 2011 indicated that Rainy Creek flowed through an area containing vermiculite waste (VW) located below the area referred to as the Amphitheater, which is located to the southwest of the Mill Pond. The VW was originally removed in 1994, as part of mine reclamation, from the Carney Creek sediment pond, which is located to the southeast of the Mill Pond. The material had been spread over the Amphitheater area as a soil substitute and re-seeded in 1995 (Montana Department of State Lands [MDST] 1995). This area was a potential source of elevated LA levels detected in Lower Rainy Creek (LRC). The removal action was performed in two phases of work, fall of 2012 and summer of 2013. Waste thickness ranged from less than 1 inch near the margins to more than 5 feet in berms and piles on the area south of Rainy Creek (MWH 2016).

Approximately 15,600 cubic yards (1,344 truckloads) of vermiculite waste were removed from approximately 4 acres in an area near the amphitheater and transported along the haul road for final placement on top of the mine in Area 2. A total of 35,440 cubic yards (3,544 truckloads) of OU4 material were used as backfill for the excavations. The backfilled area was graded for drainage and was revegetated in the fall of 2013 (MWH 2013). Fifteen total 30-point composite characterization soil samples were collected following the 2012 and 2013 removal activities to confirm the removal action was complete.

2016 Removal Action

The EPA and USFS utilized a time critical removal action (TCRA) to authorize heightened fire preparedness actions during the 2016 fire season that would enable a more aggressive initial attack to wildland fires in OU3 to enhance fire suppression effectiveness. USFS historically funded one helicopter to be stationed on the Kootenai National Forest. That helicopter was not dedicated to OU3 or the Kootenai National Forest; thus, it had been dispatched to fires elsewhere in the U.S. when necessary. Due to the priority and concern for fires starting in or near OU3, an additional helicopter was stationed in Libby during high fire preparedness levels (PLs) or as determined by fire managers to support aggressive initial attack on fire starts in OU3 as part of the 2016 TCRA. This helicopter was stationed in Libby so it could provide an immediate response to wildland fire starts in OU3. In addition to the helicopter, the TCRA included heavy equipment (dozer and lowboy) and a team of specially trained and equipped firefighters stationed in Libby to enhance fire protectiveness at OU3.

2.9 Analytical Data

Overview of Sampling Activities

Multiple RI sampling phases or events occurred in the OU3 Study Area from 2007 to 2015. Sampling and analysis activities performed as part of each phase are conducted in accordance with EPA-developed program-specific sampling and analysis plans (SAPs) and quality assurance project plans (QAPPs). An overview of the various sampling programs is discussed briefly below. Detailed information for each sampling program, including analytical results, is provided in the *RI Report* (MWH 2016).

Over the 8-year period of RI activity phases or events in the OU3 Study Area, more than 2,200 field samples have been collected and analyzed for asbestos for different media or receptor types, including:

- Surface water
- Groundwater
- Sediment
- Soil and mine waste from the Former Mine Area
- Forest soil, duff material, ash, and tree bark from forested areas
- Air (outdoor ambient/perimeter air and activity-based sampling [ABS] air samples)
- Fish and mammal tissue analysis

Additional RI activities were performed in 2012, 2013, 2014, and 2015 that were not incorporated under any of the RI phases. These activities included simulated open burning of duff material, wood-burning stove ash removal, VW removal action in the amphitheater area, wildfire monitoring and activity-based air sample collection, commercial logging activity-based air sample collection, nature and extent activity-based air sampling, nature and extent surface water and sediment sampling, nature and extent tree bark and duff sampling, low-intensity prescribed understory bum ABS, slash pile burn ABS, trespasser ABS, surface water and groundwater sampling, geotechnical and hydrogeological investigations, and the OU3 Study Area reconnaissance surveys to better understand the surficial geology and geomorphology of the LRC drainage area (MWH 2016).

The feasibility study (FS) process for OU3 is currently underway and involves two phases. Phase 1 would address unacceptable risks from exposure to LA in forest media, and Phase 2 would address unacceptable risks from exposure to LA at the Former Libby Vermiculite Mine and along Rainy Creek and other tributaries. The Phase 1 FS is currently assessing unacceptable risks to human health from exposure to LA in forest media and evaluating remedial alternatives to address unacceptable risks from those potential exposures.

2.10 Source, Nature, and Extent of Contamination

The following section presents a summary of the nature and extent of LA detected in the various media sampled in the OU3 Study Area as part of the RI. Detailed information is provided in the RI Report (MWH 2016). For the purposes of the nature and extent discussion for these constituents, the following primary media definitions (EPA 2015b) are used:

- **Mine Waste**: Soil, rock, and other earthen materials excavated from a mine and slimes, tailings, dusts, sludges, or other waste products from the crushing, cleaning, milling, or beneficiation of ores.
- **Soil**: The unconsolidated mineral or organic matter on the surface of the Earth that has been subjected to, and shows effects of, environmental factors of climate (including water and temperature effects), and macro- and microorganisms, conditioned by relief and acting on parent material over a period of time. Soil excludes materials defined as mine waste, bark, duff, or ash.

- **Bark**: The tough outer covering of the woody stems and roots of trees, shrubs, and other woody plants outside the vascular cambium.
- **Duff**: Partially to fully decomposed bark, twigs, needles, leaves, grasses, and other vegetation and the layer of litter that occurs on top of the mineral soil in forested areas.
- **Ash**: The solid residue left when combustible material is thoroughly burned.
- **Surface water**: Any waters on the Earth's surface, including but not limited to streams, lakes, ponds, and reservoirs, and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir, or other surface water. Water bodies used solely for treating, transporting, or impounding pollutants shall not be considered surface water.
- **Groundwater**: Water occupying the voids within a geologic stratum and within the zone of saturation.

Soils and Mine Waste

In general, the highest percentages of LA (polarized light microscopy-visual area estimation [PLM-VE]) reported in samples were from road soil (25 percent, sample TS-C-11, collected on a mine bench), bedrock (8 percent, outcrop sample MS-25), waste rock (5 percent, sample MS-15), and coarse tailings (4 percent, sample GT-11). The extent of LA (PLM-VE) levels in soil, mine waste, and bedrock samples (0.2 percent by mass) extends approximately 1,544 acres within the boundaries of the Former Mine Area and along Rainy Creek although LA was detected at levels below 0.2 percent beyond this area. The only forest soil samples with detections of LA (PLM-VE) (trace or higher) were collected within approximately 2 miles from the center of the Former Mine Area (Near)[1]. Approximately 40.7 million cubic yards (MCY) of waste rock, 3.2 MCY of fine tailings, and 14.7 MCY of coarse tailings are present within the boundaries of the Former Mine Area (MWH 2016).

Groundwater

Only 2 of the 20 samples collected from shallow wells/piezometers contained concentrations of LA greater than the maximum contaminant level (MCL)[2]. Both are attributed to sediment (due to insufficient development and/or pump issues) in the piezometers. No impacts above the MCL in bedrock groundwater were observed (MWH 2016).

Surface Water and Sediment – Fleetwood Creek

MCL exceedances for LA in surface water in Fleetwood Creek only occur at one sampling station, which is adjacent to and downslope of the coarse tailings. The highest surface water concentration at that location is 28 MFL (MWH 2016).

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1 Samples were grouped into three specified distances from the mine: near (within 2 miles from the center of the Former Mine Area), intermediate (between 2 and 6 miles from the center of the Former Mine Area), and far (greater than 6 miles from center of the Former Mine Area).

2 As discussed in the RI (MWH 2016), LA concentrations in surface water and groundwater were compared with the National Primary Drinking Water Regulation (NPDWR) MCL for asbestos of 7 million fibers per liter (MFL) of water. The MCL is based on fibers longer than 10 micrometers (µm) in length.

Surface Water and Sediment – Carney Creek

MCL exceedances for LA in surface water in Carney Creek occur only at the sampling station located near the confluence with Lower Rainy Creek. LA MCL exceedances were recorded in only 3 of 39 surface water samples at that location. Elevated LA concentrations also were detected in several seep surface water samples. Fine-fraction LA was detected in all sediment samples collected from the seep, creek, and pond sampling locations in the Carney Creek drainage. The detected LA concentrations in the surface water and sediment samples collected at the seep locations were among the highest detected in the OU3 Study Area (MWH 2016).

Surface Water and Sediment – Rainy Creek

Upper Rainy Creek

No MCL exceedances for LA in surface water occur along Upper Rainy Creek. LA concentrations in surface water and sediment increase with proximity to the disturbed areas of the mine (MWH 2016).

Tailings Pond Area

MCL exceedances in surface water only occur at the TP pond sampling location in 20 percent of the samples collected. The maximum concentrations of LA >10 µm in surface water are reducing in magnitude over time at sample location TP (MWH 2016).

KDID Toe Drains

The concentrations of LA >10 µm in aqueous toe drain samples have all been well below the MCL and were lower than concentrations in the tailings pond. The low levels of LA in the KDID toe drains are likely due to the contributions of unimpacted groundwater to the toe drain flow. The lack of significant LA levels detected in groundwater samples would be expected to reduce LA concentrations within the toe drain samples (MWH 2016).

East Tubb Gulch

No MCL exceedances for LA in surface water occur in East Tubb Gulch. Surface water results suggest the East Tubb Gulch drainage is not contributing significant amounts of LA to Lower Rainy Creek (MWH 2016).

Lower Rainy Creek

Surface water sample analyses indicate exceedances of the MCL at various sampling locations in Lower Rainy Creek occurring typically between the months of April and May, with maximum concentrations up to 66 MFL >10 µm (MWH 2016).

Surface Water and Sediment – Kootenai River

Seventy-three surface water samples were collected and analyzed for LA at sample locations spread out over approximately 33 miles of the Kootenai River, starting upstream of the mouth of Lower Rainy Creek to the City of Troy. There were no exceedances of the LA MCL in any of the 73 water samples analyzed; the highest concentration of LA >10 µm was 0.098 MFL, with a mean concentration of 0.006 MFL (MWH 2016).

Twenty sediment samples were collected and analyzed by the PLM-VE method for fine fraction LA at sample locations between upstream of the Rainy Creek Mouth to approximately 8 miles north-northeast of the City of Troy. The highest concentration of fine fraction LA in the sediment samples was Bin B2 (0.2 to <1 percent); the mean concentration of fine fraction LA in the sediment samples was 0.3 percent in mass (MWH 2016).

Tree Bark, Duff Material, Ash, and Smoke

Generally, phase contract microscopy-equivalent (PCME) LA levels were highest within tree bark and duff closest to the Former Mine Area and within a northeast trending area that correlates with the prevailing wind directions. The mean PCME LA levels for tree bark for the near, intermediate, and far data groupings were 0.74, 0.22, and 0.049 million structures per square centimeter (Ms/cm^2), respectively. The mean total LA levels for tree bark for the near, intermediate, and far data groupings were 3.7, 0.88, and 0.17 Ms/cm^2, respectively (MWH 2016).

The mean PCME LA levels for duff samples from the near, intermediate, and far data groupings were 141, 18, and 1.2 million structures per gram-dry weight (Ms/g-dw), respectively. The mean total LA levels for duff samples from the near, intermediate, and far data groupings were 733.7, 78.8, and 6.8 Ms/g-dw, respectively (MWH 2016).

These data indicate LA levels in tree bark and duff material tend to decrease with increasing distance from the Former Mine Area (MWH 2016).

Results of controlled burn tests using LA-impacted duff and firewood from the OU3 Study Area indicate the majority (>90 percent) of the LA fibers present in the media that is burned do not become entrained in air emissions but are retained in the ash (MWH 2016).

Ambient Air

Ambient air sampling was conducted during a period that closely represented typical wind conditions at the OU3 Study Area. PCME LA levels in ambient air ranged from non-detect (ND) to 0.0056 structures per cubic centimeter (s/cc) (MWH 2016). The *Final Site-Wide Human Health Risk Assessment (HHRA)* (EPA 2015a) states that exposures to outdoor ambient air concentrations at the levels detected at the OU3 Study Area do not pose a significant risk to human health.

Activity-Based Sampling Air

Personal air ABS result concentrations span several orders of magnitude, depending on the scenario, the intensity of the disturbance scenario, location of the disturbance, level of LA in the disturbed media, and meteorological conditions. The personal air ABS concentrations tend to decrease with distance from the Former Mine Area, which is also consistent with the mean levels for both tree bark and duff material that also tend to decrease as a function of distance from the Former Mine Area. These ABS air data are used in the *Final Site-wide HHRA* to evaluate potential exposures and risks from inhalation of LA.

Tissue

LA fibers were present in the fillet tissues of fish collected from the Mill Pond at a mean concentration of LA >10 µm of 1.2 x 10^6 structures per gram of tissue on a wet weight (s/g, ww). LA was not detected in any muscle or organ tissues of a mule deer that was hunted from within the OU3 Study Area (MWH 2016).

2.11 Human Health Risk Assessment

The *Final Site-Wide HHRA* (EPA 2015a) quantifies potential human health risks from exposure to LA at the OU3 Study Area. Results of the risk assessment are intended to help risk managers determine if remedial actions are necessary to address risks, and if so, which exposure scenarios would need to be addressed in future remedial actions.

Over 150 different exposure scenarios were evaluated as part of the risk assessment. Risk estimates for these exposure scenarios were evaluated both individually and cumulatively in the risk assessment. Cumulative risk is expressed as the sum of cancer risks or non-cancer hazard quotients (HQs) from various exposure scenarios. If the cumulative non-cancer[3] HQ (referred to as the hazard index [HI]) is less than or equal to 1, then remedial action is generally not warranted unless there are adverse environmental impacts.

Cumulative risk calculations show that people who are predominantly exposed at locations with lower LA levels in source media are likely to have cumulative risks that are below a level of concern even when the cumulative scenario includes many different exposure activities across multiple OUs. Cumulative exposure and risk can be reduced by changing the locations where the activities are performed (e.g., collecting firewood from areas far from the mine site). Cumulative exposure has the potential to become significant if most receptor lifetime is spent at properties and in locations where LA is present and where people are engaging in source disturbance activities that have a high potential for LA releases. When cumulative exposure includes scenarios where LA-contaminated source materials are disturbed, such as trespassing on the disturbed area of the mine site or performing certain activities related to commercial logging operations near the mine site, these exposures may be important risk drivers for cumulative risk estimates. EPA defines a risk driver as an individual exposure scenario that contributes a substantial fraction of the cumulative risk. Addressing exposures for the risk drivers for each potential receptor will have the greatest impact in lowering cumulative exposures and risks. (EPA 2015a)

To ensure protectiveness in consideration of cumulative exposures, an exposure scenario HQ value of 0.6 was identified as the threshold for identifying individual exposure scenarios that had the potential to contribute to unacceptable risks (MWH 2016). Of those exposure scenarios that relate to the OU3 Study Area, the following exposure scenarios had estimated HQs greater than or equal to 0.6 (MWH 2016):

- Outdoor worker exposures during commercial logging activities in OU3 near the mine, especially those logging activities that disturb soil and duff material (e.g., site restoration, skidding) (HQ=2 for site restoration; HQ=5 for skidding)
- Firefighter exposures during an understory burn that occurs near the mine (HQ=0.7) and while performing mop-up activities following the understory burn (HQ=5 during dry mop-up and HQ=1 during wet mop-up)
- Forest worker exposures while building slash piles near the mine (HQ=2)

[3] For a given exposure scenario, non-cancer HQs can exceed 1 even when cancer risks are less than 1×10^{-4}, which indicates that non-cancer exposure is a more sensitive metric of potential concern. For this reason, the EE/CA focuses on the protection of non-cancer effects.

- Trespasser rock hound exposures in the disturbed area of the mine in OU3 (HQ=2)
- Residential exposures while emptying ash from the woodstove when firewood is collected from near the mine (HQ=2)
- Recreational visitor exposures while hiking along lower Rainy Creek (HQ=0.6)

2.12 Surrounding Land Use and Population

The largest population center near the OU3 Study Area is the City of Libby. The City of Libby consists of a small "downtown" core with populated areas spreading in several directions, primarily along highways and stream valleys. Businesses are focused in the downtown core and along U.S. Highway 2 and Highway 37. Local tax records and other information suggest there are approximately 7,000 individual residential, commercial, and public properties within the NPL boundary (Montana Cadastral 2013). Based on the most recent population estimates available, approximately 2,600 people reside within the city limits of Libby, and approximately 10,000 people reside in the general area of Libby (zip code 59923), which includes the populated areas outside the city limits (U.S. Census Bureau 2013).

Historically, Libby's economy largely was supported by natural resources extraction industries such as logging and mining. Over time, mining operations and log mills have closed, and tourism is playing an increasing role in the local economy of Libby (MWH 2016). The land surrounding the Former Mine Area is managed for multiple uses by the USFS and by timber companies for logging. Due to concerns of disturbing potential LA-contaminated media, timber harvesting, fuels management, and other management activities authorized in the Kootenai National Forest Plan are not presently allowed in the OU3 Study Area (MWH 2016). The area is used by the public for recreational activities such as camping, hunting, and firewood gathering. Mining operations in the OU3 Study Area ceased in 1990, and access to mined property is restricted by signs and locked gates, but trespassers may occasionally enter on foot (MWH 2016).

2.13 Wildfire Occurrence

OU3 is dominated by dry-site interior Douglas fir and ponderosa pine forests. South aspects generally consist of more open stands of large diameter ponderosa pine and Douglas fir, with grass and shrubs in the understory. These drier south aspects historically would have exhibited low fire severity with shorter fire return intervals. The north aspects are heavily timbered with denser, closed stands of Douglas fir and other mixed conifers (e.g., western larch, grand fir, lodgepole) with heavier fuel loads on the forest floor. The heavier fuel loads and denser forests typically found on north aspects historically would have exhibited mixed to stand replacing fires with longer fire return intervals.

The area within the OU3 FS Boundary experiences on average 0.9 fires per year due to human and natural causes. Table 2-1 and Figure 2-2 detail the number of fires per year, acres burned per year, and location of fires within the OU3 FS Boundary for the last 30 years (1987-2016). Human-caused fires are generally from forest users and adjacent landowners. Weather induced, naturally ignited lightning fires can cause multiple fire starts within a short duration of time. Statistically, 56 percent of the fire starts have been caused by lightning, and 44 percent have been caused by human activities over the last 30 years (1987-2016). USFS has performed aggressive initial attack in recent years, which has minimized the size of wildland fires within OU3. The last wildland fire

in OU3 greater than 1,000 acres occurred in 1910, burning approximately 11,000 acres. The absence of recent 1,000-plus acre wildfires in OU3 does not indicate a lack of fire potential, as the area experiences smaller wildfires annually and aggressive initial attack efforts have proven successful. The area of the Kootenai National Forest containing OU3 was identified as an area of importance for fire suppression once sampling efforts indicated the presence of LA in the soil, duff, and bark. USFS began utilizing specially trained firefighters in specialized personal protective equipment during the fire season of 2010 for all fire suppression activities in OU3 due to LA contamination.

Section 3

Removal Action Scope, Goals, and Objectives

3.1 Statutory Limits on Removal Actions

Section 104(c)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that Superfund–financed removal actions not continue after $2 million has been obligated for the response action or 12 months has elapsed from the date of the initial response to a release or threatened release of hazardous substances. A removal action may qualify for exemption from the $2 million/12-month statutory limits; the conditions for an exemption include one or more of the following:

- Continued response actions are immediately required to prevent, limit, or mitigate an emergency; there is an immediate risk to public health or welfare or the environment; and such assistance will not otherwise be provided on a timely basis.
- Appropriate response actions have been determined in consultation with the state(s), and the state(s) in which the source of the release is located have entered into cooperative agreements or contracts with the federal government concerning the actions.
- Continued response action is otherwise appropriate and consistent with the remedial action to be taken.

The original Action Memorandum for the Site, dated May 23, 2000 (EPA 2000a), provided the documentation required to meet the NCP section 300.415(b) criteria for a removal action. Without an exemption, fund-financed removal actions have a statutory limit of $2,000,000 and 12-month duration limit. The Action Memorandum Amendment, dated May 2002 (EPA 2002), provided EPA's determination concerning the consistency exemption at the Site — that the continued response action is otherwise appropriate and consistent with the remedial action to be taken. See CERCLA § 104(c)(1)(C) (NCP § 300.415(b)(5)(ii)). These determination continues to apply to OU3 removal actions. Because this EE/CA addresses a joint EPA-USFS removal action that is being prepared separately from the other removal actions at the Site, it only shows costs for the NTCRA for fire preparedness in OU3, not for the remaining portions of the Site.

3.2 Determination of Removal Action Scope

The general objective of a removal action, in accordance with CERCLA and the NCP, is to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release of hazardous substances or pollutants or contaminants to the environment. The scope of the EE/CA is limited to LA-related fire preparedness activities for USFS and contractor personnel in OU3, and the goal of the NTCRA is to minimize the potential for a wildland fire and the corresponding risks from LA liberated from source media. In particular, this includes risk of exposure to firefighters, risks from migration of LA-contaminated ash to waterways, and risks of release of LA-contaminated tailings from the failure of the KDID. This action is considered an interim action because it is expected that the remedial action for OU3 will ultimately address the remaining risks from LA contamination.

3.2.1 Geographic Scope of the EE/CA

The geographic scope of this NTCRA, referred to herein as the "OU3 removal action area," is delineated by the OU3 FS Boundary used for the remedial process for OU3. The OU3 FS Boundary, which represents a portion of the larger OU3 Study Area described in Section 2, is shown on Figure 2-1. The OU3 FS Boundary was delineated primarily by the location of areas where unacceptable risks from exposures to LA-contaminated duff/soil have been shown and considers information on measured LA concentrations in duff and soil, air modeling, and site topography. KDC owns approximately 3,600 acres of land within the OU3 removal action area, which includes the Former Mine Area. Land surrounding the KDC property within the OU3 removal action is mainly within the Kootenai National Forest, which is managed by the USFS (approximately 5,400 acres). Approximately 640 acres of land parcels are owned by the State of Montana, 350 acres of land parcels are owned by Weyerhaeuser Company for commercial logging, and approximately 70 acres of other private land parcels. The OU3 removal action area encompasses approximately 10,000 acres, which includes the above acreage values.

For purposes of this EE/CA, it is assumed that LA-related fire preparedness measures are in preparation for response to any fire starts within the OU3 removal action area. Nearby streams and creeks, including those outside of the OU3 removal action area, could be impacted by wildfires within the OU3 removal action area as discussed in Section 3.2.2. Therefore, wildland fire impacts to surface water bodies outside of the OU3 removal action area from LA fire preparedness activities in the OU3 removal action area are considered in this EE/CA. However, LA preparedness activities for areas outside of the OU3 removal action area are not addressed by this EE/CA.

3.2.2 Removal Action Objectives

The following RAOs have been identified for this EE/CA:

1. Reduce the exposure of firefighters to LA released from forest-related source media during and after a wildland fire.
    - Rationale: The HHRA identified unacceptable risks to firefighters from exposure to LA during an understory burn and while performing post-fire mop-up (both wet and dry).
2. Reduce generation of LA-contaminated wildfire ash from existing forest-related source media that could result in the contamination of nearby drinking water resources.
    - Rationale: Following wildland fires, the post-fire ash containing LA in burned areas is susceptible to transport by erosion and runoff after precipitation events, increasing the potential for migration of LA to nearby surface water bodies. Migration of LA to nearby surface water bodies could threaten potential drinking water supplies.
3. Reduce the probability of a release of LA-contaminated tailings from a failure of the KDID resulting from increased post-fire runoff of precipitation and erosion of sediment into the tailings impoundment that the currently damaged spillway of the KDID would not be able to accommodate.
    - Rationale: Large post-fire precipitation events, resulting in water and sediment loading behind the dam, could cause the principal spillway to fail, thereby potentially releasing large amounts of LA-contaminated tailings into Rainy Creek and downstream water supplies on the Kootenai River.

3.2.3 Scope of LA-Related Fire Preparedness Measures

The scope of this EE/CA is LA-related fire preparedness activities prior to the initiation of a fire response. The following activities are included in the scope of this EE/CA as it relates to LA-related fire preparedness:

- The stationing of OU3-dedicated equipment and personnel at Libby
- Asbestos-related exposure training for OU3-dedicated personnel
- The procurement and fitting of personal protective equipment (PPE) as well as the procurement of any decontamination units required for OU3-dedicated equipment and personnel at Libby

The scope of this EE/CA does not include 'on the ground' firefighting activities, including initial response to fires and fire suppression. As such, the alternatives would include any LA-related fire preparedness measures up to the point at which 'on the ground' activities would be required for response to a fire start. However, the alternative analysis does evaluate the consequences from LA preparedness on achievement of the RAOs during fire response. For instance, exposure risks to firefighters are evaluated because differing levels of LA-related fire preparedness may ultimately result in differing exposure risk outcomes during fire response and suppression and thus differing consequences of the actions taken under the alternatives. Similarly, the potential for releases of LA from forest-related source media and the tailings impoundment behind the KDID are also evaluated as outcomes from differing levels of LA fire preparedness.

3.3 Determination of Tentative Removal Action Schedule

Fire-related concerns for release of LA from forest-related source media at OU3 have been addressed through previous removal action work, including a TCRA for the 2016 fire season (EPA 2016). This NTCRA will address LA-related fire-preparedness at OU3 until a remedial action for OU3 is selected and implemented.

The elements of this NTCRA would need to be implemented starting with the 2017 fire season. The following is a tentative schedule of major removal action milestones:

Activity	Tentative Date
Draft EE/CA	April 2017
Public comment period	April through May 2017
Response to significant public comments	May 2017
Action Memorandum Amendment	May 2017
Removal action design/planning	May 2017
NTCRA implementation start	June 2017
NTCRA implementation completion	Minimum 3 years – anticipated end of 2019

The NTCRA would not involve post removal site control (PRSC) activities that are typically performed after an NTCRA because this NTCRA involves LA-related fire preparedness within OU3 and would continue until a remedial action is initiated for OU3. For the purposes of this EE/CA, it is assumed that this NTCRA would be implemented in 2017 and completed in a minimum of 3 years.

3.4 Planned Remedial Activities

There are additional remedial activities currently being implemented for the area addressed in this NTCRA. An RI for OU3 has been completed, and the FS for Phase 1 of OU3 is currently in development. The FS process for OU3 involves two phases. Phase 1 would address unacceptable risks from exposure to LA in forest media, and Phase 2 would address unacceptable risks from exposure to LA at the Former Libby Vermiculite Mine and along Rainy Creek, the Kootenai River, and other tributaries. The Phase 1 FS is currently assessing unacceptable risks to human health from exposure to LA in forest media and evaluating remedial alternatives to address unacceptable risks from those potential exposures. The completion of the Phase 1 and Phase 2 FS will culminate in EPA's selection of a final remedial plan for OU3 in a ROD and the implementation of the selected remedy. This NTCRA would cover the near-term activities before the selected remedy is implemented.

Section 4

Identification and Analysis of Removal Action Alternatives

4.1 Overview

This section describes and analyzes each removal action alternative identified and developed to address fire-related concerns at the OU3 removal action area.

The following removal action alternatives were identified for evaluation in this EE/CA:

- Removal Action Alternative (RA) 1: No LA-Related Fire Preparedness Activities
- RA2: LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support
- RA3: LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

These removal action alternatives are evaluated and compared using the criteria specified in EPA's *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (EPA 1993). Evaluation criteria are used to compare removal action alternatives in the areas of effectiveness, implementability, and cost. The evaluation criteria and subcriteria are:

Effectiveness

- **Overall Protection of Human Health and the Environment –** This subcriterion evaluates how each alternative achieves adequate protection and describes how the alternative will reduce, control, or eliminate risks at the NTCRA area through the use of treatment, engineering, or institutional controls. This evaluation should identify any unacceptable short-term impacts.
- **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) and Other Criteria, Advisories, and Guidance –** This subcriterion evaluates how each alternative addresses and complies with ARARs of federal and state statutes as well as other criteria, advisories, and guidance that are typically identified as "to be considered" (TBC) information. However, no ARARs specific to LA-related fire preparedness have been identified for this NTCRA, which results in acceptable compliance with ARARs for all alternatives.
- **Long-Term Effectiveness and Permanence –** This subcriterion evaluates the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes in the NTCRA area. Magnitude of risk as well as adequacy and reliability of controls are specific factors evaluated.
- **Reduction in Toxicity, Mobility, or Volume through Treatment –** This subcriterion evaluates EPA's policy of preference for treatment (i.e., for technologies that will permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element).

- **Short-Term Effectiveness –** This subcriterion evaluates the effects of the alternative during implementation before the removal objectives have been met. Alternatives should also be evaluated with respect to their effects on human health and the environment following implementation. Protection of the community and workers, environmental impacts, and time until response objectives are achieved are specific factors evaluated.

Implementability

- **Technical Feasibility –** This subcriterion evaluates the ability of the technology to implement the removal action. The reliability of the technology is also of concern as technical problems associated with implementation may delay the schedule.
- **Administrative Feasibility –** This subcriterion evaluates those activities needed to coordinate with other offices and agencies. The administrative feasibility of each alternative should be evaluated, including the need for offsite permits, adherence to applicable non-environmental laws, and concerns of other regulatory agencies. Statutory limits, permits, and waivers are specific factors evaluated.
- **Availability of Services and Materials –** This subcriterion determines if offsite treatment, storage and disposal capacity, equipment, personnel, services and materials, and other resources necessary to implement an alternative will be available in time to maintain the removal schedule. Availability of funds to meet PRSC requirements is also a factor.
- **State (Support Agency) Acceptance –** This subcriterion evaluates the State of Montana's (through the Montana Department of Environmental Quality [DEQ] and DNRC) anticipated response to and acceptance of a removal action alternative.
- **Community Acceptance –** This subcriterion evaluates the public's anticipated response to and acceptance of a removal action alternative.

Cost

- **Direct Capital Costs, Indirect Capital Costs, and Annual PRSC Costs –** This subcriterion evaluates the capital for materials, equipment, and related items. While annual PRSC costs normally would be provided, this NTCRA does not involve any as discussed in Section 3.3. Cost estimates for each removal action alternative were developed in accordance with *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000b). As stated in this guidance, it is also pertinent to development of cost estimates for an EE/CA.

The last two subcriteria of implementability (State Acceptance and Community Acceptance) are not directly evaluated in this EE/CA. The agency acceptance and the community acceptance criteria are evaluated when the final decision on the proposed removal action is selected in conjunction with the preparation of the Action Memorandum. These two subcriteria are extremely significant; careful planning and consideration are required to gain adequate acceptance.

The descriptions and evaluation using the qualitative ratings system of each removal action alternative (RA1, RA2, and RA3) are presented in Sections 4.2, 4.3, and 4.4, respectively. The qualitative rating categories are defined in Exhibit 5-1 in Section 5. The detailed rationale for the ratings is provided in Appendix A.

4.2 Alternative RA1: No LA-Related Fire Preparedness Activities

4.2.1 Removal Alternative Component Descriptions

Alternative RA1 assumes that standard USFS fire preparedness activities would be followed in the OU3 removal action area with no added LA-related fire preparedness activities being conducted. Alternative RA1 would not include OU3-dedicated aerial or ground resources based in Libby such as helicopters, specially trained firefighting crews, and dozers. Fires that start within the OU3 removal action area would be addressed based on standard USFS prioritization structures and resource availability. Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. This standard response would include fire starts within the OU3 removal action area where human health risks from forest-related source media containing LA, such as duff, are the highest as illustrated in Figure 2-1, thus, exposing firefighters to elevated LA exposure risks.

4.2.2 Summary of Detailed Analysis for Alternative RA1

Evaluation of criteria for Alternative RA1 is provided in **Exhibit 4-1**. The exhibit includes the qualitative ratings for each criterion and reference to the evaluation tables in Appendix A that provide justification for the rating. Evaluation of state (support agency) acceptance and community acceptance for Alternative RA1 is not directly evaluated in this EE/CA. Please see Sections 4.5 and 4.6 for detailed explanations.

Exhibit 4-1. Detailed Analysis Summary – Alternative RA1

Evaluation Criterion	Evaluation Subcriterion	Qualitative Rating	Evaluation Table Reference (Appendix A)
Effectiveness	Overall Protection of Human Health and the Environment	Unacceptable	A-1
	Compliance with ARARs	Acceptable	A-1
	Long-Term Effectiveness and Permanence	Low	A-1
	Reduction of Toxicity, Mobility, or Volume through Treatment	None	A-1
	Short-Term Effectiveness	Low	A-1
Implementability	Technical Feasibility	High	A-2
	Administrative Feasibility	High	A-2
	Availability of Services and Materials	Moderate	A-2
	State (Support Agency) Acceptance	Not Evaluated	A-2
	Community Acceptance	Not Evaluated	A-2
Cost	Direct Capital Costs, Indirect Capital Costs, and Annual PRSC Costs (Present Value)	None	A-3

4.3 Alternative RA2: LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support

4.3.1 Removal Alternative Component Descriptions

Alternative RA2 includes LA-related fire preparedness through increased firefighting resources based in Libby, including OU3 aerial resources with a limited dedicated ground crew to support the aerial response. These aerial resources would allow for an aggressive initial aerial attack on fire starts within the OU3 removal action area. Normal fire preparedness activities would continue for fire starts outside the OU3 removal action area and are not evaluated in this EE/CA. Fire response, including the initial response to fires and fire suppression, is not addressed in this alternative and is outside the scope of this EE/CA.

For the purposes of this EE/CA, it is assumed that the period of analysis for this alternative would be a minimum of 3 years. This alternative would include added resources, above and beyond normal fire preparedness resources. Thus, additional expenses would be incurred for stationing of increased fire-related resources at Libby for heightened LA-related fire preparedness. The following increased fire-related resources are assumed to include but are not limited to:

- A helicopter would be stationed at the Libby Airport when PL reaches PL 4 or 5 or as determined by fire managers. Similar to the 2016 TCRA (described in Section 2.8), this helicopter would be an added resource that would be brought in for use in responding to fires within the OU3 removal action area. Initially, as the PL is raised to PL 4 based on seasonal fire severity, fire activity, and firefighting resource availability, a Type 2 helicopter (with a carrying capacity of up to 360 gallons) would be utilized. If the severity of the fire season warrants a higher capacity helicopter, a Type 1 helicopter (with a carrying capacity of 700 to 2,500 gallons) would be brought in to replace the Type 2 helicopter.
- A limited ground-based crew would be based in Libby to support the aerial activities. The role of the dedicated two-person fireline leadership crew during fire response activities would be to serve as observers to guide aerial activities and determine the effectiveness of extinguishing the fire but would not construct fire lines or perform mop up activities. In addition to the two-person crew, a fire manager would be based in Libby to oversee the LA-related fire activities. This ground crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.

4.3.2 Summary of Detailed Analysis for Alternative RA2

Evaluation of criteria for Alternative RA2 is provided in **Exhibit 4-2**. The exhibit includes the qualitative ratings for each criterion and reference to the evaluation tables in Appendix A that provide justification for the rating. Evaluation of state (support agency) acceptance and community acceptance for Alternative RA2 is not directly evaluated in this EE/CA. Please see Sections 4.5 and 4.6 for detailed explanations.

Exhibit 4-2. Detailed Analysis Summary – Alternative RA2

Evaluation Criterion	Evaluation Subcriterion	Qualitative Rating	Evaluation Table Reference (Appendix B)
Effectiveness	Overall Protection of Human Health and the Environment	Acceptable	A-4
	Compliance with ARARs	Acceptable	A-4
	Long-Term Effectiveness and Permanence	Moderate	A-4
	Reduction of Toxicity, Mobility, or Volume through Treatment	None	A-4
	Short-Term Effectiveness	Moderate	A-4
Implementability	Technical Feasibility	Moderate to High	A-5
	Administrative Feasibility	Moderate	A-5
	Availability of Services and Materials	Moderate to High	A-5
	State (Support Agency) Acceptance	Not Evaluated	A-5
	Community Acceptance	Not Evaluated	A-5
Cost	Direct Capital Costs, Indirect Capital Costs, and Annual PRSC Costs (Present Value)	$5,709,000	A-6

4.4 Alternative RA3: LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

4.4.1 Removal Alternative Component Descriptions

Alternative RA3 includes heightened LA-related fire preparedness through increased firefighting resources, including OU3 aerial resources and ground crew support. These dedicated aerial and ground crews would allow for an aggressive initial attack on new fire starts within the OU3 removal action area. Normal fire preparedness activities would continue for fire starts outside the OU3 removal action area and are not evaluated in this EE/CA. Fire response, including the initial response to fires and fire suppression, is not addressed in this alternative and is outside the scope of this EE/CA.

For the purposes of this EE/CA, it is assumed that the period of analysis for this alternative would be a minimum of 3 years. Additionally, this alternative would include added resources, above and beyond normal fire preparedness resources. Thus, additional expenses would be incurred for stationing of increased fire-related resources at Libby for heightened LA-related fire preparedness. The following increased fire-related resources are assumed to include but are not limited to:

- A helicopter would be stationed at the Libby Airport when PL reaches PL 4 or 5 or as determined by fire managers. Similar to the 2016 TCRA (described in Section 2.8), this helicopter would be an added resource that would be brought in for use in responding to fires within the OU3 removal action area. Initially, as the PL is raised to PL 4 based on seasonal fire severity, fire activity, and firefighting resource availability, a Type 2 helicopter (with a carrying capacity of up to 360 gallons) would be utilized. If the severity of the fire season warrants a higher capacity helicopter, a Type 1 helicopter (with a carrying capacity of 700 to 2,500 gallons) would be brought in to replace the Type 2 helicopter.

- A dedicated and specially trained ground-based crew would be based in Libby during the fire season to allow for initial attack of fire starts with low-moderate potential. The ground crew would be available to quickly respond on the ground to one to two new fire starts at any given time. The USFS has determined that a 10-person firefighting crew would be required for ground response given the size of the OU3 removal action area and the historical fire data (See Figure 2-2). This ground crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.
- To support the aerial and ground resources, a dedicated two-person fireline leadership crew would be based in Libby. The role of the dedicated two-person fireline leadership crew during fire response activities would be to serve as observers to guide aerial activities and determine the effectiveness of extinguishing the fire as well as commanding the ground-based crew to construct fire lines or perform mop up activities. In addition to the two-person crew, a fire manager would be based in Libby to oversee the LA-related fire preparedness activities. This crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.
- A dozer and transport equipment would also be based in Libby to support the ground-based crew. The dozer would be required to support firefighting activities such as expeditiously building fire lines. This equipment would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this equipment would be dedicated to OU3.

4.4.2 Summary of Detailed Analysis for Alternative RA3

Evaluation of criteria for Alternative RA3 is provided in **Exhibit 4-3**. The exhibit includes the qualitative ratings for each criterion and reference to the evaluation tables in Appendix A that provide justification for the rating. Evaluation of state (support agency) acceptance and community acceptance for Alternative RA3 is not directly evaluated in this EE/CA. Please see Sections 4.5 and 4.6 for detailed explanations.

Exhibit 4-3. Detailed Analysis Summary – Alternative RA3

Evaluation Criterion	Evaluation Subcriterion	Qualitative Rating	Evaluation Table Reference (Appendix B)
Effectiveness	Overall Protection of Human Health and the Environment	Acceptable	A-7
	Compliance with ARARs	Acceptable	A-7
	Long-Term Effectiveness and Permanence	Moderate to High	A-7
	Reduction of Toxicity, Mobility, or Volume through Treatment	None	A-7
	Short-Term Effectiveness	Moderate to High	A-7
Implementability	Technical Feasibility	Moderate to High	A-8
	Administrative Feasibility	Moderate	A-8
	Availability of Services and Materials	Moderate to High	A-8
	State (Support Agency) Acceptance	Not Evaluated	A-8
	Community Acceptance	Not Evaluated	A-8
Cost	Direct Capital Costs, Indirect Capital Costs, and Annual PRSC Costs (Present Value)	$7,781,000	A-9

4.5 State (Support Agency) Acceptance

Consistent with the state's role under the NCP, the agencies will afford the State of Montana (through DEQ and DNRC) the opportunity to comment on the EE/CA. Although there has been initial feedback from state agencies, a full assessment of the state acceptance will not be completed until comments on the EE/CA are submitted to EPA and USFS by DEQ and DNRC. DEQ and DNRC may review the alternatives, and its concerns will be considered in determining the recommended alternative in the final EE/CA and in the final selection of the removal action in the Action Memorandum. Thus, state acceptance is not considered in the detailed analysis of alternatives presented in the EE/CA.

4.6 Community Acceptance

Assessment of community acceptance will include responses to questions any interested person in the community may have regarding any component of the removal action alternatives presented in the final EE/CA. Interviews have been conducted with some representatives of the community, but a full assessment will be completed after EPA receives public comments on the final EE/CA during the public commenting period. Thus, community acceptance is not considered in the detailed analysis of alternatives presented in the EE/CA.

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Section 5

Comparative Analysis of Removal Action Alternatives

This EE/CA evaluates the three removal action alternatives in Section 4 against the short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost, as well their sub-criteria. The results of the detailed analysis for each removal action alternative are presented in Exhibit 5-1 to allow comparative analysis of the alternatives and identify the key trade-offs between them as presented in the EE/CA. Comparative analysis for the removal action alternatives using the evaluation criteria has been put into narrative form in the following subsections. Only significant comparative differences between alternatives are presented; the full set of rationale for the qualitative ratings is provided in Appendix A.

5.1 Overall Protection of Human Health and the Environment

Alternative RA1 was given an "unacceptable" rating because it would fail to provide protection for human health and the environment. Alternative RA1 would not meet RAO1 because this alternative would result in standard firefighting crews without PPE or asbestos training responding to fires and performing mop-up duties within the OU3 removal action area, thus, resulting in unacceptable exposure risks to firefighters. Additionally, RA1 may not be able to meet RAOs 2 and 3 because standard firefighting resources may not be available at the time a fire starts in the OU3 removal action area because they are not stationed in Libby. This delayed response could allow fire starts to become wildland fires with higher burn severity and result in releases of LA from forest-related source media containing LA and generation of LA-contaminated wildland fire ash. Since the ability to respond to wildland fires would be uncertain, the size and spread of wildland fires could result in burned areas that are susceptible to transport by erosion and surface water runoff after precipitation events and thus the potential for migration of LA-contaminated ash to nearby surface water bodies that are potential drinking water supplies. In addition, burned areas with susceptibility to high-flow runoff events within the OU3 removal action area could result in increased post-fire runoff and erosion of sediment into the KDID. In turn, this could result in risk of failure of the KDID from the currently damaged spillway and a release of LA-contaminated tailings from failure of the KDID to downstream surface water bodies.

Alternatives RA2 and RA3 were given an "acceptable" rating. Both alternatives would include OU3-dedicated resources stationed in Libby in order to provide an immediate initial attack on fire starts within the OU3 removal action area. The utilization of aerial support to provide an aggressive initial attack would be an effective tactic to prevent a fire start within the OU3 removal action area from becoming a wildland fire and reduce burn severity. For both alternatives, generation of LA-contaminated wildland fire ash would be reduced because heightened LA-related fire preparedness would provide the resources and training to reduce the size and spreading of wildland fires within the OU3 removal action area. Decreasing the size and spread of wildland fires also would reduce the amount of burned areas that are susceptible to transport by erosion and surface water runoff after precipitation events and reduce the potential for migration of LA-

contaminated ash to nearby surface water bodies. In addition, it would reduce the likelihood of a release of LA-contaminated tailings as a result of a potential failure of the KDID. Due to a reduced burned area, there would be less susceptibility to high-flow runoff events that could result in increased post-fire runoff and erosion of sediment into the KDID and risk of failure from the currently damaged spillway at the KDID. Both alternatives would address the RAOs and provide adequate protection for human health and the environment. However, there is some uncertainty about the extent of reductions achieved for RAOs 2 and 3 under Alternative RA2 due to the limitations of an aerial approach with limited ground support. Limitations of Alternative RA2 include the potential inability to extinguish fire starts due to the absence of a full ground crew. Thus, fire starts may grow larger in size and burn for longer periods of time for Alternative RA2 than for Alternative RA3. However, the absence of a full ground crew under Alternative RA2 would reduce the exposure of firefighters as indicated by RAO1. Under Alternative RA3, preventing a wildland fire from growing would reduce the risk of exposure to firefighters due to reduced size of the area impacted by the fire and reduce the area of mop-up required.

5.2 Compliance with ARARs

No ARARs specific to LA-related fire preparedness have been identified for this NTCRA. Therefore, all alternatives were given an "acceptable" rating for compliance with ARARs.

5.3 Long-term Effectiveness and Permanence

Alternative RA1 provides only minimal long-term effectiveness and permanence. Alternative RA1 assumes that standard USFS fire preparedness activities would be followed in the OU3 removal action area with no added LA-related fire preparedness activities being conducted. Under this alternative, firefighting activities in the Kootenai National Forest would not include OU3-specific aerial or dedicated ground resources aimed at reducing LA exposures such as helicopters, specially trained firefighting crews, and dozers based in Libby. Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. As discussed in Section 5.1, this alternative would not address RAO1 and may not be able to meet RAOs 2 and 3. The presence of elevated levels of LA would pose unacceptable risks to standard firefighting crews responding to fires and performing mop-up duties within the OU3 removal action area. Standard firefighting resources may not be available at the time a fire starts in the OU3 removal action area because they are not stationed in Libby. This delayed response could allow fire starts to become wildland fires. If a wildland fire does occur, the ground in burned areas is susceptible to transport by erosion and surface water runoff after precipitation events, thus, increasing the potential for migration of LA-contaminated ash to nearby surface water bodies. Additionally, those areas are susceptible to high-flow runoff events that could increase the risk of failure from the currently damaged spillway at the KDID. This alternative was given a rating of "low."

Alternative RA2 was given a rating of "moderate." It is expected that Alternative RA2 would reduce potential human health risks from wildland fires in areas with elevated LA within the OU3 removal action area. However, there is some uncertainty about the extent of reductions achieved due to the limitations of an aerial approach with limited ground support. Limitations of Alternative RA2 include the potential inability to extinguish fire starts due to the absence of a full ground crew. Thus, fire starts may grow larger in size and burn for longer periods of time than for

Alternative RA3. The structural instability at KDID would remain a risk. Failure at KDID potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River as LA-contaminated tailings are currently stored and managed within the KDID. Heightened LA-related fire preparedness would provide the resources and training to allow for dedicated firefighting resources to reduce the burn severity of a fire. In doing so, increased runoff caused by reduced vegetation following a fire would be limited within the OU3 removal action area although uncertainties exist due to the limitations of an aerial approach with limited ground support. Aerial resources with limited ground support are expected to provide adequate control for preventing a fire start from becoming a wildland fire. However, without the assistance of a full ground support crew, uncertainties exist due to the limitations of an aerial approach with limited ground support. Ultimately, risks from unaddressed LA in forest-related source media would be addressed when a final remedy is implemented for OU3.

Alternative RA3 was given a rating of "moderate to high." Alternative RA3 would prevent potential wildland fires through heightened LA-related fire preparedness, including OU3 aerial and dedicated ground resources. Alternative RA3 would provide an added level of long-term effectiveness compared to Alternative RA2 because the addition of a full ground support crew would provide the ability for a more aggressive initial attack on a wildland fire. Preventing a wildland fire from growing would reduce the risk of exposure to firefighters due to reduced size of the area impacted by the fire and requiring mop-up. LA-contaminated wildland fire ash would be minimized because heightened LA-related fire preparedness would provide the resources and training to reduce the size and spread of wildland fires within the OU3 removal action area. The likelihood of a release of LA-contaminated tailings as a result of a potential failure of the KDID, resulting from a wildland fire and subsequent significant precipitation events on the de-vegetated watershed, would be reduced. Ultimately, risks from unaddressed LA in forest-related source media would be addressed when a final remedy is implemented for OU3.

5.4 Reduction of Toxicity, Mobility, and Volume through Treatment

None of the alternatives would treat LA-contaminated forest-related source media within the OU3 removal action area. Thus, Alternatives RA1, RA2, and RA3 were given a rating of "none" because they fail to provide a reduction of toxicity, mobility, or volume through treatment.

5.5 Short-Term Effectiveness

Alternative RA1 provides only minimal short-term effectiveness and was given a rating of "low." Wildland fires could result from a delayed response to fire starts in OU3 because standard firefighting resources are not stationed in Libby and may not be available at the time a fire starts. The potential impacts to the workers would include exposure to unacceptable risks from elevated levels of LA. Due to absence of LA-related fire preparedness measures, standard firefighting crews without PPE or asbestos training would be responding to fire starts in OU3. The presence of elevated levels of LA would pose unacceptable risks to standard firefighting crews responding to fires and performing mop-up duties within the OU3 removal action area. Potential impacts to the community and environment from wildland fires include migration of LA contamination from forest-related source media to nearby surface waters that are potential drinking water supplies and additional releases of LA contamination from impounded tailings in the event of a failure of

the KDID. Following wildland fires, the ground in burned areas is susceptible to transport by erosion and surface water runoff after precipitation events, thus, increasing the potential for migration of LA-contaminated ash to nearby surface water bodies. Additionally, those areas are susceptible to high-flow runoff events that could increase the risk of failure from the currently damaged spillway at the KDID.

Alternative RA2 was given a rating of "moderate." Ground workers serving as observers to support aerial activities potentially would be exposed to LA from airborne ash during wildland fires. LA-related fire preparedness would include safety procedures, such as respirator use and asbestos training, that would provide added protection to workers, thus, minimizing these exposures. Heightened LA-related fire preparedness would provide added protection to the environment from risks posed by LA due to wildland fires by reducing the growth of wildland fires and potential dispersion of LA. Limiting wildland fire growth would reduce the short-term impacts to the community and the environment by reducing the generation of wildland fire ash and the susceptibility of burned areas to erosion and surface water runoff. Thus, heightened LA-related fire preparedness would provide the resources to reduce the dispersion of LA to nearby surface waters that are potential drinking water supplies. It is also expected that LA-related fire preparedness would provide the resources to reduce risks of failure at KDID that potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River; however, uncertainties exist due to the limitations of an aerial approach with limited ground support.

Alternative RA3 was given a rating of "moderate to high." Alternative RA3 would provide an added level of short-term effectiveness compared to Alternative RA2 because of the addition of a full ground support crew to provide the ability for a more aggressive initial attack on a wildland fire. Ground workers performing firefighting activities and mop-up duties potentially would be exposed to LA at levels posing potentially unacceptable risks. LA-related fire preparedness would include safety procedures, such as respirator use and asbestos training, that would provide added protection to workers, thus, minimizing these exposures. Heightened LA-related fire preparedness would provide the resources to minimize the dispersion of LA to nearby surface waters that are potential drinking water supplies. It is also expected that LA-related fire preparedness would provide the resources to minimize risks of failure at KDID that would potentially result in LA contaminant transport to lower Rainy Creek and the Kootenai River.

5.6 Technical Feasibility

Alternative RA1 was given a rating of "high." No LA-related fire preparedness activities specific to the OU3 removal action area would be conducted, so there are no impacts to technical feasibility.

Alternatives RA2 and RA3 were given a rating of "moderate to high." LA-related fire preparedness activities add additional complexities; however, these activities have been conducted at OU3 with success as part of the 2016 TCRA. As part of these alternatives, LA-related fire preparedness activities do not preclude future remedial actions at OU3. Future remedial actions will address LA posing unacceptable risks, but by providing heightened LA-related fire preparedness for the area within the OU3 removal action area under both alternatives, further dispersion of LA by wildland fires would be minimized.

5.7 Administrative Feasibility

Alternative RA1 assumes no further action would be undertaken to address risks from wildland fires and resulting releases of LA contamination. Because no new removal action is taken, this alternative was given a rating of "high."

Although the number of activities is greater for Alternative RA3, both Alternatives RA2 and RA3 involve heightened LA-related fire preparedness activities. The original Action Memorandum for the Site, dated May 23, 2000 (EPA 2000a), provided the documentation required to meet the NCP Section 300.415(b) criteria for a removal action. Without an exemption, fund-financed removal actions have a statutory limit of $2,000,000 and 12-month duration limit. The Action Memorandum Amendment, dated May 2002 (EPA 2002), provided EPA's determination concerning the consistency exemption at the Site – that the continued response action is otherwise appropriate and consistent with the remedial action to be taken. Both alternatives would be performed within the boundary of the Site; thus, no offsite permits would be required. Both alternatives would require coordination between multiple government agencies, including the USFS, EPA, DEQ, and DNRC. Both alternatives were given a rating of "moderate."

5.8 Availability of Services and Materials

Alternative RA1 assumes fires within the OU3 removal action area would be addressed based on standard USFS prioritization structures. It assumes utilization of standard firefighting crews, which are a common resource within Kootenai National Forest, and it is assumed to not include OU3-dedicated technical equipment or specialists. Contaminated areas within the Kootenai National Forest, such as the OU3 removal action area, are considered as part of the USFS prioritization structures and additional policies or protocols may be implemented for determining fire response within the OU3 removal action area. As such, availability of services within the OU3 removal action area may be more limited than areas of the Kootenai National Forest without LA-related exposure risks. Thus, Alternative RA1 was given a rating of "moderate" for availability of services.

Alternative RA2 would include the use of aerial resources and a limited ground crew. While this alternative would require technical specialists for training personnel, PPE for firefighting and mop-up activities within the OU3 removal action area, and specialized helicopters designed for firefighting activities, those can be secured with sufficient planning, time, and funding. USFS has contracting mechanisms in place to secure these resources and base them within Libby. Thus, alternative RA2 was given a rating of "moderate to high" for availability of services.

Alternative RA3 would include the use of aerial resources and a full ground support crew. Like Alternative RA2, this alternative would require technical specialists for training personnel, PPE for firefighting and mop-up activities within the OU3 removal action area, personnel for the ground crew, and specialized helicopters designed for firefighting activities; these can be secured with sufficient planning, time, and funding. USFS has contracting mechanisms in place to secure these resources and base them within Libby. Thus, Alternative RA3 was given a rating of "moderate to high" for availability of services.

5.9 State (Support Agency) Acceptance

As discussed in Section 4.5, a full assessment of the state acceptance will not be completed until comments on the EE/CA are submitted to EPA and USFS by DEQ and DNRC. However, initial feedback from DNRC indicates strong support for aggressive suppression of wildland fires within OU3, which presumably would be associated with Alternative RA3.

5.10 Community Acceptance

As discussed in Section 4.6, a full assessment of the community acceptance will be completed after EPA receives public comments on the final EE/CA during the public commenting period. However, interviews have been conducted with some representatives of the community who have indicated general support for heightened fire preparedness within OU3, which shows general acceptance of Alternatives RA2 and RA3 over Alternative RA1.

5.11 Cost

Present value costs for all removal action alternatives were analyzed over a 3-year period of analysis. The costs presented below correspond to total costs incurred throughout a 3-year period.

The present value cost for Alternative RA1 was given a rating of "none." The present value cost for this alternative is approximately $0.

The present value cost for Alternative RA2 was given a rating of "moderate to high." The present value cost for this alternative is approximately $5,709,000.

The present value cost for Alternative RA3 was given a rating of "high." The present value cost for this alternative is approximately $7,781,000.

Exhibit 5-1. Summary of Comparative Analysis for Removal Action Alternatives

Removal Action Alternative	Description	Effectiveness					Implementability					Cost	
		Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Technical Feasibility	Administrative Feasibility	Availability of Services and Materials	State (Support Agency) Acceptance	Community Acceptance	Present Value Cost (Dollars)	
RA1	No LA-Related Fire Preparedness Activities	Unacceptable	Acceptable	Low	None	Low	High	High	Moderate	**NE**	**NE**	None	$0
RA2	LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support	Acceptable	Acceptable	Moderate	None	Moderate	Moderate to High	Moderate	Moderate to High	**NE**	**NE**	Moderate to High	$5,709,000
RA3	LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support	Acceptable	Acceptable	Moderate to High	None	Moderate to High	Moderate to High	Moderate	Moderate to High	**NE**	**NE**	High	$7,781,000

Notes

1. The numerical designations for the qualitative ratings system used in this table are not used to quantitatively assess removal action alternatives (for instance, individual rankings for an alternative are not additive).
2. Detailed cost spreadsheets (cost summaries, present value analyses, and cost worksheets) for each alternative are presented in Appendix B.
3. Costs are based on a 3-year period of analysis.

Legend for Qualitative Ratings System:

Effectiveness and Implementability		Cost
For First Two Criteria	**For Rest of the Criteria**	**Present Value Cost in Dollars**
Unacceptable	**None**	**None**
Acceptable	**Low**	**Low ($0 through $1.5M)**
	Low to Moderate	**Low to Moderate ($1.5M through $3M)**
	Moderate	**Moderate ($3M through $4.5M)**
	Moderate to High	**Moderate to High ($4.5M through $6M)**
	High	**High (Greater than $6M)**
	NE (Not Evaluated)	

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Section 6

Recommended Removal Action Alternative

Taking into consideration the evaluation criteria presented in this EE/CA, the recommended removal action alternative for the Libby OU3 EE/CA is Alternative RA3: LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support. Alternative RA3 includes heightened LA-related fire preparedness through increased firefighting resources, including OU3 aerial resources and dedicated ground crew support. The dedicated aerial resources and ground crew would provide the necessary resources to enable an aggressive initial attack on new fire starts within the OU3 removal action area.

Alternative RA1 assumes that standard USFS fire preparedness activities would be followed in OU3 with no added LA-related fire preparedness activities being conducted. It does not provide adequate protection of human health and the environment and has the lowest effectiveness. Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. Thus, Alternative RA1 would not meet RAO1 as the alternative would result in firefighters exposed to unacceptable risks within the OU3 removal action area. Additionally, RA1 may not be able to meet RAOs 2 and 3 because standard firefighting resources may not be available at the time a fire starts in the OU3 removal action area because they are not stationed in Libby. If a wildland fire does occur, the ground in burned areas is susceptible to transport by erosion and surface water runoff after precipitation events, thus, increasing the potential for migration of LA-contaminated ash to nearby surface waters that are potential drinking water supplies. Additionally, those areas are susceptible to high-flow runoff events that could increase the risk of failure from the currently damaged spillway at the KDID.

Alternative RA2 provides an added level of protection over Alternative RA1 through the inclusion of OU3 aerial resources and a limited ground crew. Unlike Alternative RA1, Alternative RA2 would address the RAOs through heightened LA-related fire preparedness; however, there is some uncertainty about the extent of reductions achieved for RAOs 2 and 3 due to the limitations of an aerial approach with limited ground support. Limitations of Alternative RA2 include the potential inability to extinguish fire starts due to the absence of a full ground crew.

Alternative RA3 utilizes aerial support in combination with a ground crew to provide the most effective and reliable tactic to prevent a fire start from becoming a wildland fire and minimize burn severity. Under this alternative, LA-contaminated wildland fire ash would be minimized because heightened LA-related fire preparedness would provide the resources to reduce the size and spreading of wildland fires within the OU3 removal action area. Reducing the size and spread of wildland fires also would reduce the amount of burned areas that are susceptible to transport by erosion and surface water runoff after precipitation events, thus, reducing the potential for migration of LA-contaminated ash to nearby surface waters that are potential drinking water supplies. In addition, it would reduce the likelihood of a release of LA-contaminated tailings as a result of a potential failure of the KDID. Due to a reduced burned area, there would be less susceptibility to high-flow runoff events that could result in increased post-fire runoff and

erosion of sediment into the KDID and risk of failure from the currently damaged spillway at the KDID. Alternative RA3 provides the most effective measures to address the three RAOs and would provide adequate protection for human health and the environment.

Alternative RA3 has higher long-term effectiveness and permanence and short-term effectiveness than Alternative RA2. Technical feasibility, administrative feasibility, and availability of services are not significantly different between Alternatives RA2 and RA3. Alternative RA1, which involves standard USFS fire preparedness activities, does not provide for overall protection of human health and has the lowest effectiveness. While the difference between costs for Alternatives RA2 and RA3 is significant, the added level of overall effectiveness based on "long-term effectiveness and permanence" and "short-term effectiveness" for Alternative RA3 over Alternative RA2 (Exhibit 5-1) would make Alternative RA3 the recommended alternative.

Section 7
References

EPA. 1993. Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA. EPA 540-R-057. August.

EPA. 2000a. Unilateral Administrative Order for Removal Response Activities, Libby Asbestos Site, Export Plant, Libby, Montana. May.

EPA. 2000b. A Guide to Developing and Documenting Cost Estimates during the Feasibility Study. EPA 540-R-00-002. July.

EPA. 2002. Action Memorandum Amendment for the Time-Critical Removal Action at the Libby Asbestos Site – Libby, Lincoln County, Montana. May.

EPA. 2015a. Final Site-Wide Human Health Risk Assessment Libby Asbestos Superfund Site, Libby, Montana. November, 2015.

EPA. 2015b. *Final Remedial Action Objectives and Media Definitions for Libby Asbestos Site - Operable Unit 3*. Letter to Robert J. Medler, Director, remediation W.R. Grace & Co. September 21.

EPA. 2016. Action Memorandum Requesting Approval for Time-Critical Removal Action to Address Libby Amphibole Asbestos Contamination in Operable Unit 3 of the Libby Asbestos National Priorities List Site in Libby, Montana. July.

Hafferman Engineering, Inc. (HEI). 2016. Kootenai Development Impoundment Dam: Box Culvert Assessment Report. December.

MDST (Montana Department of State Lands). 1995. Kootenai Development Hard Rock Bureau Reclamation Division Operating Permit - Field Inspection Report. May 1995.

Meeker, G. P., A. M. Bern, I. K. Brownfield, H. A. Lowers, S. J. Sutley, T. M. Hoeffen, and J. S. Vance. 2003. The Composition and Morphology of Amphiboles from the Rainy Creek Complex, Near Libby, Montana. American Mineralogist 88:1955-1969.

Montana Cadastral. 2013. Lincoln County Database. Accessed at: http://svc.mt.gov/msl/mtcadastral/. Accessed on October 31, 2013.

MWH Americas, Inc. (MWH). 2013. *Summary Report for Removal of Asbestos-Containing Vermiculite Waste near the Amphitheater. Libby Asbestos Superfund Site OU3*. Final. September 2013.

MWH. 2016. Final Remedial Investigation Report, Operable Unit 3 Study Area, Libby Asbestos Superfund Site, Libby, Montana. Revision 1 – November 2016. November.

MWH. 2017. Draft KDID Spillway Risk Assessment, Operable Unit 3 Study Area, Libby Asbestos Superfund Site, Libby, Montana. February.

National Oceanic and Atmospheric Administration (NOAA). 2016. Summary of Annual Climatic Data Normals 1981-2010. Retrieved December 6, 2016, from http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mt5015 [1981-2010, NCDC 1981-2010 Normals]

U.S. Census Bureau. 2013. Census 2010 Information. Accessed at quickfacts.census.gov on November 15, 2013.

U.S. Department of Agriculture Forest Service Region 1 (USDAFSR1). 2008. http://www.fs.fed.us/r1/kootenai/resources/plants/graphs.shtml

Figures

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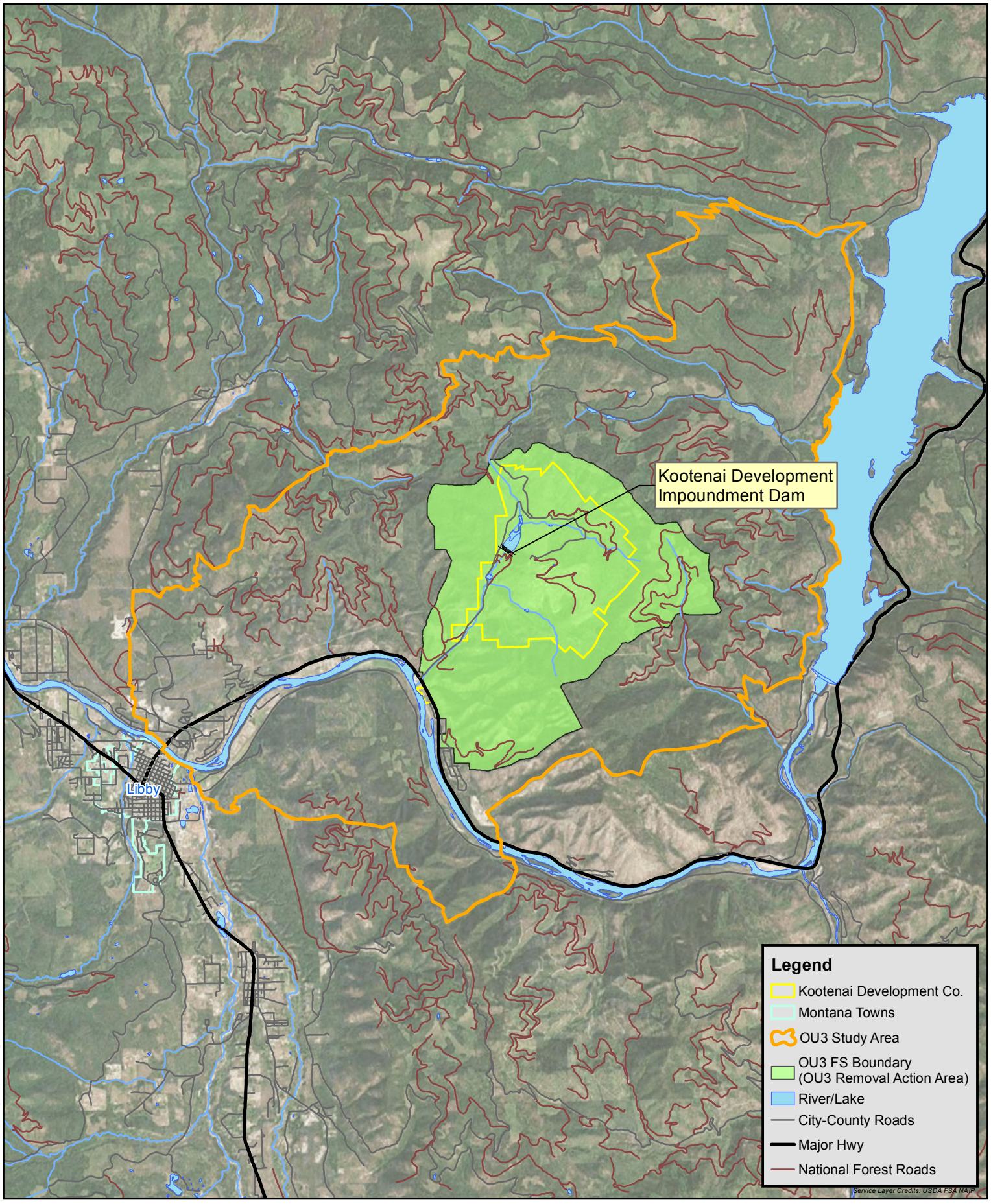

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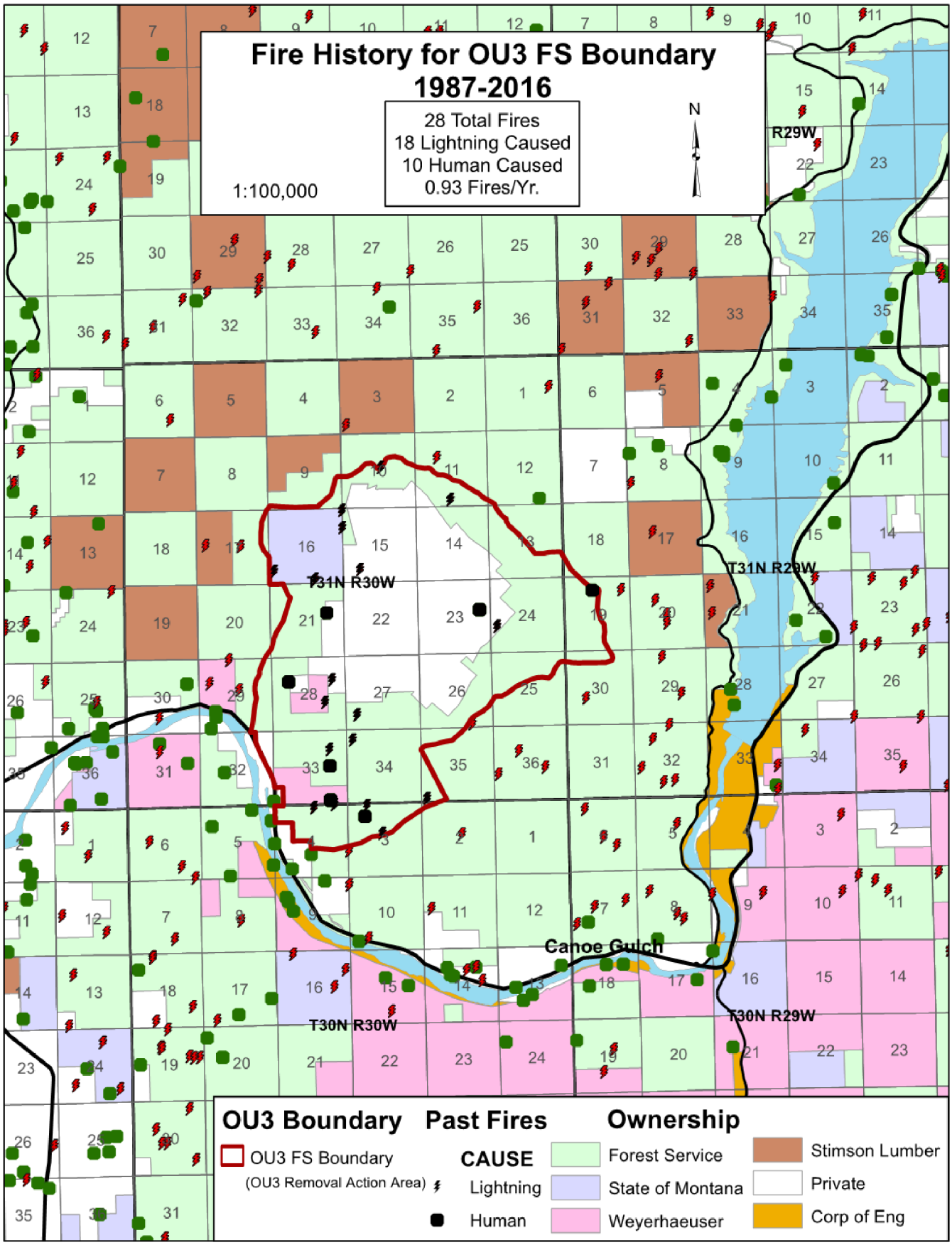
US Army Corps of Engineers

Figure 2-1
OU3 Study Area and OU3 FS Boundary



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US Army Corps of Engineers

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Figure 2-2
Fire History (1987-2016) for OU3 FS Boundary

Tables

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Table 2-1
Fire History (1987–2016) for OU3 FS Boundary

Number of Fires and Acres Burned per Year (1987 - 2016) - OU3 FS Boundary					
Year	Number of Fires	Acres Burned	Year	Number of Fires	Acres Burned
1987	2	0.2	2002	0	0
1988	2	0.2	2003	0	0
1989	3	0.3	2004	5	10.4
1990	1	0.3	2005	0	0
1991	3	0.7	2006	1	0.1
1992	2	0.2	2007	2	0.35
1993	0	0	2008	0	0
1994	3	1.5	2009	0	0
1995	0	0	2010	0	0
1996	0	0	2011	0	0
1997	1	0.1	2012	0	0
1998	0	0	2013	0	0
1999	3	1.2	2014	0	0
2000	0	0	2015	0	0
2001	0	0	2016	0	0
Total Number of Fires:		**28**	**Total Acres Burned:**		**15.55**
Average Number of Fires per Year:		**0.9**	**Average Acres Burned per Year:**		**0.5**

Appendix A

Analysis of Removal Action Alternatives

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Alternative RA1

No LA-Related Fire Preparedness Activities

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Table A-1. Evaluation Summary for the Effectiveness Factors – Alternative RA1

Evaluation Factors for Effectiveness		Evaluation Summary
Overall Protection of Human Health and the Environment	Adequate protection of human health and the environment shall be evaluated for long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site	▪ Alternative RA1 assumes that standard USFS fire preparedness activities would be followed in OU3 with no added LA-related fire preparedness activities being conducted. ▪ Under this alternative, firefighting activities in the Kootenai National Forest would not include OU3-dedicated aerial or dedicated ground resources aimed at reducing LA exposures, such as helicopters, specially-trained firefighting crews, and dozers. ▪ Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. The presence of elevated levels of LA would pose unacceptable risks to standard firefighting crews responding to fires and performing mop-up duties within the OU3 removal action area. Thus, Alternative RA1 would not meet RAO1 as the alternative would result in firefighters exposed to unacceptable risks within the OU3 removal action area. ▪ This alternative may not be able to meet RAOs 2 and 3 because standard firefighting resources may not be available at the time a fire starts in the OU3 removal action area because they are not stationed in Libby. This delayed response could allow fire starts to become wildland fires with higher burn severity, and result in releases of LA from forest-related source media containing LA and generation of LA-contaminated wildland fire ash. Since the ability to respond to wildland fires would be uncertain, the size and spread of wildland fires could result in burned areas susceptible to transport by erosion and surface water runoff after precipitation events and thus, increases the potential for migration of LA-contaminated ash to nearby surface water bodies that are potential drinking water supplies. In addition, burned areas with susceptibility to high-flow runoff events within the OU3 removal action area could result in increased post-fire runoff and erosion of sediment into the KDID. In turn, this could result in risk of failure of the KDID from the currently damaged spillway and a release of LA-contaminated tailings from failure of the KDID to downstream surface water bodies.
Compliance with ARARs and Other Criteria, Advisories, and Guidance	Compliance with chemical-specific ARARs	▪ No ARARs specific to LA-related fire preparedness have been identified for this NTCRA.
	Compliance with location-specific ARARs	
	Compliance with action-specific ARARs	

Table A-1. Evaluation Summary for the Effectiveness Factors – Alternative RA1 (continued)

Evaluation Factors for Effectiveness		Evaluation Summary
Long-Term Effectiveness and Permanence	Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the removal activities	▪ Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. The presence of elevated levels of LA would pose unacceptable risks to standard firefighting crews responding to fires and performing mop-up duties within the OU3 removal action area
	Adequacy and reliability of controls that are used to manage treatment residuals and untreated waste remaining at the site	▪ Standard firefighting resources may not be available at the time a fire starts in the OU3 removal action area because they are not stationed in Libby. This delayed response could allow fire starts to become wildland fires. If a wildland fire does occur, the ground in burned areas is susceptible to transport by erosion and surface water runoff after precipitation events and thus, increases the potential for migration of LA-contaminated ash to nearby surface waters that are potential drinking water supplies. Additionally, those areas are susceptible to high-flow runoff events that could increase the risk of failure from the currently damaged spillway at the KDID. ▪ Once the remedial process for OU3 is complete, the selected remedy is implemented, and current and potential future risks are addressed, the need for heightened LA-related fire preparedness may not be required. However, this EE/CA addresses near-term activities before that process is complete. Therefore, this alternative does not provide adequate and reliable controls for the current and potential future risks posed by wildland fires.
Reduction of Toxicity. Mobility or Volume through Treatment	The treatment processes, the alternative uses, and materials they will treat	▪ This alternative would not treat LA-contaminated forest-related source media; thus, there would be no reduction of toxicity, mobility, or volume of contamination through treatment.
	The amount of hazardous substances, pollutants, or contaminants that will be destroyed or treated	
	The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment	
	The degree to which the treatment is irreversible	
	The type and quantity of residuals that will remain following treatment	
	Whether the alternative will satisfy the preference for treatment	

Table A-1. Evaluation Summary for the Effectiveness Factors – Alternative RA1 (continued)

Evaluation Factors for Effectiveness		Evaluation Summary
Short-Term Effectiveness	Short-term risks that might be posed to the community during implementation of an alternative	▪ Wildland fires could result from a delayed response to fire starts in OU3 because standard firefighting resources are not stationed in Libby and may not be available at the time a fire starts. Potential impacts to the community from wildland fires include migration of LA contamination from forest-related source media to nearby surface waters and additional releases of LA contamination from impounded tailings in event of a failure of the KDID. If a wildland fire does occur, the ground in burned areas is susceptible to transport by erosion and surface water runoff after precipitation events and thus, increases the potential for migration of LA-contaminated ash to nearby surface water bodies that are potential drinking water supplies. Additionally, those areas are susceptible to high-flow runoff events that could increase the risk of failure from the currently damaged spillway at the KDID.
	Potential impacts on workers during removal action and the effectiveness and reliability of protective measures	▪ Due to absence of LA-related fire preparedness measures, standard firefighting crews without PPE or asbestos training would ultimately be responding to fire starts in OU3. The presence of elevated levels of LA would pose unacceptable risks to standard firefighting crews responding to fires and performing mop-up duties within the OU3 removal action area.
	Potential adverse environmental impacts from implementation of an alternative and the reliability of mitigation measures in preventing or reducing the potential impacts	▪ Wildland fires could result from a delayed response to fire starts in OU3 because standard firefighting resources are not stationed in Libby and may not be available at the time a fire starts. Potential impacts to the environment from wildland fires include migration of LA contamination from forest-related source media to nearby surface waters and additional releases of LA contamination from impounded tailings in event of a failure of the KDID. If a wildland fire does occur, the ground in burned areas is susceptible to transport by erosion and surface water runoff after precipitation events and thus, increases the potential for migration of LA-contaminated ash to nearby surface water bodies that are potential drinking water supplies. Additionally, those areas are susceptible to high-flow runoff events that could increase the risk of failure from the currently damaged spillway at the KDID. ▪ Due to absence of LA-related fire preparedness measures, a decontamination unit would not be available for the decontamination of equipment and personnel that respond to fires within OU3. As a result, equipment and personnel could spread LA contamination from OU3 to uncontaminated parts of the Kootenai National Forest.
	Time until protection is achieved	▪ No further action would be implemented to provide protection from elevated LA risks from a wildland fire within the OU3 removal action area. Until a selected remedy is implemented as part of the remedial process, overall protection from unacceptable LA risks would not be achieved.

Table A-2. Implementability Evaluation Summary – Alternative RA1

Evaluation Factors for Implementability		Evaluation Summary
Technical feasibility	Technical difficulties and unknowns associated with the construction and operation of a technology	▪ No LA-related fire preparedness activities specific to the OU3 removal action area would be conducted, so there are no impacts to technical feasibility.
	Reliability of the technology, focusing on technical problems that will lead to schedule delays	
	Potential future removal action, difficulty to implement PRSC measures or operation and maintenance (O&M) or future removal actions	
	Ability to monitor the effectiveness of the alternative	
Administrative feasibility	Evaluate alternative for compliance with the statutory limits which requires the alternative to remain under $2 million or completed within a 12-month limit	▪ No further removal action would be undertaken to address risks from wildland fires and resulting releases of LA contamination; thus, this criterion would be met.
	Evaluate whether alternative will require off-site permits or other factors including easements, right-of-way agreements, or zoning variances	▪ No offsite removal activities would be conducted under this alternative.
Availability of services and materials	Availability of adequate offsite treatment, storage capacity, and disposal capacity and services	▪ This alternative would not require offsite treatment, storage, and disposal services. Thus, these criteria are not applicable.
	Availability of personnel and technology to maintain the removal schedule	▪ This alternative assumes that standard USFS fire preparedness activities would be followed in OU3 with no added LA-related fire preparedness activities being conducted. As such, this alternative would result in utilization of standard firefighting crews that are a common resource within Kootenai National Forest and it is assumed to not require OU3-dedicated technical equipment or specialists. ▪ Contaminated areas within the Kootenai National Forest, such as the OU3 removal action area, are considered as part of the USFS prioritization structures and additional policies or protocols may be implemented for determining fire response within the OU3 removal action area. As such, availability of services within the OU3 removal action area may be more limited than areas of the Kootenai National Forest without LA-related exposure risks.
	Availability of services and materials (i.e. laboratory testing capacity, turnaround for chemical analyses, adequate supplies and equipment for on-site activities, or installation of extra utilities)	
	Availability of prospective technologies	
State (Support Agency) Acceptance	State concerns will be considered in determining the recommended alternative in the EE/CA and in the final selection of the alternative in the Action Memorandum	▪ This criterion is not directly evaluated in this EE/CA. For detailed explanation please refer Section 4.5. However, initial feedback from DNRC indicates strong support for aggressive suppression of wildland fires within OU3, which would presumably be associated with Alternative RA3
Community Acceptance	Acceptance from the community will be considered in determining a recommendation for the EE/CA and in the final selection of the alternative in the Action Memorandum	▪ This criterion is not directly evaluated in this EE/CA. For detailed explanation please refer Section 4.6. However, interviews have been conducted with some representatives of the community that have indicated general support for heightened fire preparedness within OU3, which show general acceptance of Alternatives RA2 and RA3 over Alternative RA1.

Table A-3. Cost Evaluation Summary – Alternative RA1

Evaluation Factors for Cost	Approximate Cost (Dollars)
Total capital cost	$0
Total annual PRSC cost	$0
Total cost (excluding present value discounting)	$0
Total present value cost	$0

Note: Total costs are for the assumed period of analysis (3 years). Costs are rounded to the nearest $1,000. The NTCRA would not involve PRSC activities that are typically performed after a NTCRA, since this NTCRA involves LA-related fire preparedness within OU3 and would continue until a remedial action is initiated for OU3.

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Alternative RA2

LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support

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Table A-4. Evaluation Summary for the Effectiveness Factors – Alternative RA2

Evaluation Factors for Effectiveness		Evaluation Summary
Overall Protection of Human Health and the Environment	Adequate protection of human health and the environment shall be evaluated for long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site	▪ The RAOs would be addressed through heightened LA-related fire preparedness, however there is some uncertainty about the extent of reductions achieved for RAOs 2 and 3 due to the limitations of an aerial approach with limited ground support. ▪ This alternative would include OU3 aerial resources stationed in Libby in order to provide an immediate initial attack on fire starts within the OU3 removal action area. The utilization of aerial support to provide an aggressive initial attack could be an effective tactic to prevent a fire start within the OU3 removal action area from becoming a wildland fire and reduce burn severity. ▪ Limitations of Alternative RA2 include the potential inability to extinguish fire starts due to the absence of a full ground crew. Thus, fire starts may grow larger in size and burn for longer periods of time. ▪ Generation of LA-contaminated wildland fire ash would be reduced because heightened LA-related fire preparedness would provide the resources to reduce the size and spreading of wildland fires in the OU3 removal action area, although uncertainties exist due to the limitations of an aerial approach with limited ground support. ▪ Decreasing the size and spread of wildland fires would also reduce the amount of burned areas that are susceptible to transport by erosion and surface water runoff after precipitation events and thus, reduce the potential for migration of LA-contaminated ash to nearby surface water bodies. ▪ Decreasing the size and spread of wildland fires would also reduce the likelihood of a release of LA-contaminated tailings as a result of a potential failure of the KDID. Due to a reduced burned area, there would be less susceptibility to high-flow runoff events that could result in increased post-fire runoff and erosion of sediment into the KDID and risk of failure from the currently damaged spillway at the KDID.
Compliance with ARARs and Other Criteria, Advisories, and Guidance	Compliance with chemical-specific ARARs	▪ No ARARs specific to LA-related fire preparedness have been identified for this NTCRA.
	Compliance with location-specific ARARs	
	Compliance with action-specific ARARs	
Long-Term Effectiveness and Permanence	Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the removal activities	▪ Heightened LA-related fire preparedness, designed to provide the resources and training to reduce potential human health risks from large wildland fires in areas with elevated LA would be implemented within the OU3 removal action area. ▪ Limitations of Alternative RA 2 include the potential inability to extinguish fire starts due to the absence of a full ground crew. Thus, fire starts may grow larger in size and burn for longer periods of time.

Table A-4. Evaluation Summary for the Effectiveness Factors – Alternative RA2 (continued)

Evaluation Factors for Effectiveness		Evaluation Summary
Long-Term Effectiveness and Permanence (continued)	Adequacy and reliability of controls that are used to manage treatment residuals and untreated waste remaining at the site	▪ Aerial resources with limited ground support is expected to provide adequate control for preventing a fire start from becoming a wildland fire. However, without the assistance of a full ground support crew, uncertainties exist due to the limitations of an aerial approach with limited ground support. ▪ The structural instability at KDID would remain a risk. Failure at KDID potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River as LA-contaminated tailings are currently stored and managed within the KDID. Heightened LA-related fire preparedness would provide the resources to reduce the burn severity of a fire. In doing so, increased runoff caused by reduced vegetation following a fire would be limited within the OU3 removal action area, although uncertainties exist due to the limitations of an aerial approach with limited ground support. ▪ The potential for migration of LA-contaminated ash to nearby surface waters that are potential drinking water supplies would be reduced, although uncertainties exist due to the limitations of an aerial approach with limited ground support. ▪ Risks from unaddressed LA in forest related source media would ultimately be addressed when a final remedy is implemented for OU3.
Reduction of Toxicity. Mobility or Volume through Treatment	The treatment processes, the alternative uses, and materials they will treat	▪ This alternative would not treat LA-contaminated forest-related source media; thus, there would be no reduction of toxicity, mobility, or volume of contamination through treatment.
	The amount of hazardous substances, pollutants, or contaminants that will be destroyed or treated	
	The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment	
	The degree to which the treatment is irreversible	
	The type and quantity of residuals that will remain following treatment	
	Whether the alternative will satisfy the preference for treatment	

Table A-4. Evaluation Summary for the Effectiveness Factors – Alternative RA2 (continued)

Evaluation Factors for Effectiveness		Evaluation Summary
Short-Term Effectiveness	Short-term risks that might be posed to the community during implementation of an alternative	▪ Limiting wildfire growth would reduce the generation of wildfire ash and the susceptibility of burned areas to erosion and surface water runoff. Thus, heightened LA-related fire preparedness would provide the resources to reduce the dispersion of LA to nearby surface waters that are potential drinking water supplies. ▪ It is expected that LA-related fire preparedness activities would provide the resources to reduce risks of failure at KDID that potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River, although uncertainties exist due to the limitations of an aerial approach with limited ground support.
	Potential impacts on workers during removal action and the effectiveness and reliability of protective measures	▪ Ground workers serving as observers to support aerial activities potentially would be exposed to LA during wildland fires. ▪ LA-related fire preparedness would include safety procedures such as respirator use and asbestos training that would provide added protection to workers, thus minimizing these exposures.
	Potential adverse environmental impacts from implementation of an alternative and the reliability of mitigation measures in preventing or reducing the potential impacts	▪ Limiting wildfire growth would reduce the generation of wildfire ash and the susceptibility of burned areas to erosion and surface water runoff. Thus, heightened LA-related fire preparedness would provide the resources to reduce the dispersion of LA to nearby surface waters that are potential drinking water supplies. ▪ It is expected that LA-related fire preparedness activities would provide the resources to reduce risks of failure at KDID that potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River.
	Time until protection is achieved	▪ The proposed action could be implemented before the start of the upcoming fire season. The proposed action would provide protection from elevated risks from a wildland fire. However, overall protection from risks posed by unaddressed LA would not be fully achieved until a selected remedy is implemented for OU3.

Table A-5. Implementability Evaluation Summary – Alternative RA2

Evaluation Factors for Implementability		Evaluation Summary
Technical feasibility	Technical difficulties and unknowns associated with the construction and operation of a technology	▪ LA-related fire preparedness activities add additional complexities; however, these types of activities have been conducted at OU3 with success as part of the 2016 TCRA. ▪ Unknowns will always exist for wildland fires due to the uncertain nature of how many fires will occur in a given season and how severe the fire conditions will be. Because of the unknowns, it is possible that inadequate quantities of dedicated equipment and personnel would be available under worst case fire conditions within the FS Boundary.
	Reliability of the technology, focusing on technical problems that will lead to schedule delays	▪ Utilizing dedicated aerial support in combination with a limited ground crew provides a generally reliable approach for reducing the size of a wildland fire. However, without the assistance of a full ground support crew, fire starts may grow larger in size and burn for longer periods of time within the OU3 removal action area.
	Potential future removal action, difficulty to implement PRSC measures or operation and maintenance (O&M) or future removal actions	▪ LA-related fire preparedness activities as part of this alternative do not preclude future remedial actions at OU3. ▪ Future remedial actions will address LA posing unacceptable risks, but by providing heightened LA-related fire preparedness for the area within the OU3 removal action area under this alternative, further dispersion of LA by wildland fires would be reduced.
	Ability to monitor the effectiveness of the alternative	
Administrative feasibility	Evaluate alternative for compliance with the statutory limits which requires the alternative to remain under $2 million or completed within a 12-month limit	▪ The original Action Memorandum for the Site, dated May 23, 2000 (EPA 2000a), provided the documentation required to meet the NCP section 300.415(b) criteria for a removal action. Without an exemption, fund-financed removal actions have a statutory limit of $2,000,000 and 12-month duration limit. The Action Memorandum Amendment dated May 2002 (EPA 2002), provided EPA's determination concerning the consistency exemption at the Site – that the continued response action is otherwise appropriate and consistent with the remedial action to be taken.
	Evaluate whether alternative will require off-site permits or other factors including easements, right-of-way agreements, or zoning variances	▪ No offsite removal activities would be conducted under this alternative. ▪ Activities under this alternative would require coordination between multiple government agencies including the USFS, EPA, DEQ, and DNRC.
Availability of services and materials	Availability of adequate offsite treatment, storage capacity, and disposal capacity and services	▪ This alternative does not require offsite treatment, storage, and disposal services. Thus, this criterion is not applicable.
	Availability of personnel and technology to maintain the removal schedule	▪ Technical specialists for training personnel with respect to LA exposures are available. ▪ Dedicated equipment for firefighting activities within the OU3 removal action area are available. ▪ PPE required for firefighting and mop-up activities within the OU3 removal action area is available. ▪ This alternative would require the use of specialized helicopters for aerial support, but these aircrafts can be secured with sufficient planning, time, and funding. ▪ USFS has contracting mechanisms in place to secure these resources and base them within Libby
	Availability of services and materials (i.e. laboratory testing capacity, turnaround for chemical analyses, adequate supplies and equipment for on-site activities, or installation of extra utilities)	
	Availability of prospective technologies	

Table A-5. Implementability Evaluation Summary – Alternative RA2 (continued)

Evaluation Factors for Implementability		Evaluation Summary
State (Support Agency) Acceptance	State concerns will be considered in determining the recommended alternative in the EE/CA and in the final selection of the alternative in the Action Memorandum	▪ This criterion is not directly evaluated in this EE/CA. For detailed explanation please refer to Section 4.5. However, initial feedback from DNRC indicates strong support for aggressive suppression of wildland fires within OU3, which would presumably be associated with Alternative RA3.
Community Acceptance	Acceptance from the community will be considered in determining a recommendation for the EE/CA and in the final selection of the alternative in the Action Memorandum	▪ This criterion is not directly evaluated in this EE/CA. For detailed explanation please refer to Section 4.6. However, interviews have been conducted with some representatives of the community that have indicated general support for heightened fire preparedness within OU3, which show general acceptance of Alternatives RA2 and RA3 over Alternative RA1.

Table A-6. Cost Evaluation Summary – Alternative RA2

Evaluation Factors for Cost	Approximate Cost (Dollars)
Total capital cost	$6,099,000
Total annual PRSC cost	0
Total cost (excluding present value discounting)	$6,099,000
Total present value cost	$5,709,000

Note: Total costs are for the assumed period of analysis (3 years). Costs are rounded to the nearest $1,000. The NTCRA would not involve PRSC activities that are typically performed after a NTCRA, since this NTCRA involves LA-related fire preparedness within OU3 and would continue until a remedial action is initiated for OU3.

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Alternative RA3

LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

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Table A-7. Evaluation Summary for the Effectiveness Factors – Alternative RA3

Evaluation Factors for Effectiveness		Evaluation Summary
Overall Protection of Human Health and the Environment	Adequate protection of human health and the environment shall be evaluated for long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site	▪ The RAOs would be addressed through heightened LA-related fire preparedness, including OU3 aerial resources and a full ground-based crew. ▪ This alternative would include OU3 aerial resources and dedicated ground crew support stationed in Libby in order to provide an immediate initial attack on fire starts in the OU3 removal action area. The utilization of aerial support in combination with a ground crew to provide an aggressive initial attack would be the most effective tactic to prevent a fire start within the OU3 removal action area from becoming a wildland fire and minimize burn severity. ▪ Preventing a wildland fire from growing would reduce the risks to firefighters due to reduced size of the area impacted by the fire and requiring mop-up. ▪ LA-contaminated wildland fire ash would be minimized because heightened LA-related fire preparedness would provide the resources to reduce the size and spreading of wildland fires within the OU3 removal action area. ▪ Decreasing the size and spread of wildland fires would also reduce the amount of burned areas that are susceptible to transport by erosion and surface water runoff after precipitation events and thus, reduce the potential for migration of LA-contaminated ash to nearby surface water bodies. ▪ Decreasing the size and spread of wildland fires would also reduce the likelihood of a release of LA-contaminated tailings as a result of a potential failure of the KDID. Due to a reduced burned area, there would be less susceptibility to high-flow runoff events that could result in increased post-fire runoff and erosion of sediment into the KDID and risk of failure from the currently damaged spillway at the KDID.
Compliance with ARARs and Other Criteria, Advisories, and Guidance	Compliance with chemical-specific ARARs	▪ No ARARs specific to LA-related fire preparedness have been identified for this NTCRA.
	Compliance with location-specific ARARs	
	Compliance with action-specific ARARs	
Long-Term Effectiveness and Permanence	Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the removal activities	▪ Heightened LA-related fire preparedness designed to provide the resources and training to minimize potential human health risks from large wildland fires in areas with elevated LA would be implemented within the OU3 removal action area. Specifically, LA risk exposures to firefighters would be minimized due to specially trained ground crews with PPE and asbestos training.

Table A-7. Evaluation Summary for the Effectiveness Factors – Alternative RA3 (continued)

Evaluation Factors for Effectiveness		Evaluation Summary
Long-Term Effectiveness and Permanence (continued)	Adequacy and reliability of controls that are used to manage treatment residuals and untreated waste remaining at the site	▪ Aerial and ground resources are expected to provide adequate control for preventing a fire start from becoming a wildland fire. ▪ The structural instability at KDID would remain a risk. Failure at KDID potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River as LA-contaminated tailings are currently stored and managed within the KDID. Heightened LA-related fire preparedness would provide the resources to minimize the burn severity of a fire. In doing so, increased runoff caused by reduced vegetation following a fire would be limited within the OU3 removal action area. ▪ The potential for migration of LA-contaminated ash to nearby surface waters that are potential drinking water supplies would be reduced. ▪ Risks from unaddressed LA in forest related source media would ultimately be addressed when a final remedy is implemented for OU3.
Reduction of Toxicity. Mobility or Volume through Treatment	The treatment processes, the alternative uses, and materials they will treat	▪ This alternative would not treat LA-contaminated forest-related source media; thus, there would be no reduction of toxicity, mobility, or volume of contamination through treatment.
	The amount of hazardous substances, pollutants, or contaminants that will be destroyed or treated	
	The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment	
	The degree to which the treatment is irreversible	
	The type and quantity of residuals that will remain following treatment	
	Whether the alternative will satisfy the preference for treatment	
Short-Term Effectiveness	Short-term risks that might be posed to the community during implementation of an alternative	▪ Limiting wildfire growth would minimize the generation of wildfire ash and the susceptibility of burned areas to erosion and surface water runoff. Thus, heightened LA-related fire preparedness would provide the resources to minimize the dispersion of LA to nearby surface waters that are potential drinking water supplies. ▪ It is expected that LA-related fire preparedness activities would provide the resources to minimize risks of failure at KDID that potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River.

Table A-7. Evaluation Summary for the Effectiveness Factors – Alternative RA3 (continued)

Evaluation Factors for Effectiveness		Evaluation Summary
Short-Term Effectiveness (continued)	Potential impacts on workers during removal action and the effectiveness and reliability of protective measures	▪ Ground workers performing firefighting activities and mop-up duties potentially would be exposed to LA at levels posing potentially unacceptable risks. ▪ Aerial workers performing firefighting activities potentially would be exposed to LA from airborne ash during wildland fires. ▪ LA-related fire preparedness would include safety procedures such as respirator use and asbestos training that would provide added protection to workers, thus minimizing these exposures.
	Potential adverse environmental impacts from implementation of an alternative and the reliability of mitigation measures in preventing or reducing the potential impacts	▪ Limiting wildfire growth would minimize the generation of wildfire ash and the susceptibility of burned areas to erosion and surface water runoff. Thus, heightened LA-related fire preparedness would provide the resources to minimize the dispersion of LA to nearby surface waters that are potential drinking water supplies. It is expected that LA-related fire preparedness activities would provide the resources to minimize risks of failure at KDID that potentially would result in LA contaminant transport to lower Rainy Creek and the Kootenai River. ▪ There could be impacts to the environment during the LA-related fire preparedness activities due to the use of heavy equipment. Use of fuel efficient and low emission equipment could reduce environmental impacts.
	Time until protection is achieved	▪ The proposed action could be implemented before the start of the upcoming fire season. The proposed action would provide protection from elevated risks from a wildland fire. However, overall protection from risks posed by unaddressed LA would not be fully achieved until a selected remedy is implemented for OU3.

Table A-8. Implementability Evaluation Summary – Alternative RA3

Evaluation Factors for Implementability		Evaluation Summary
Technical feasibility	Technical difficulties and unknowns associated with the construction and operation of a technology	▪ LA-related fire preparedness activities add additional complexities; however, these activities have been conducted at OU3 with success as part of the 2016 TCRA. ▪ Unknowns will always exist for wildland fires due to the uncertain nature of how many fires will occur in a given season and how severe the fire conditions will be. Because of the unknowns, it is possible that inadequate quantities of dedicated equipment and personnel would be available under worst case fire conditions within the OU3 removal action area.
	Reliability of the technology, focusing on technical problems that will lead to schedule delays	▪ Utilizing dedicated aerial support in combination with a full ground crew provides the most reliable approach for minimizing the size of a wildland fire.
	Potential future removal action, difficulty to implement PRSC measures or operation and maintenance (O&M) or future removal actions	▪ LA-related fire preparedness activities as part of this alternative do not preclude future remedial actions at OU3. ▪ Future remedial actions will address LA posing unacceptable risks, but by providing heightened LA-related fire preparedness for the area within the OU3 removal action area under this alternative, further dispersion of LA by wildland fires would be minimized.
	Ability to monitor the effectiveness of the alternative	
Administrative feasibility	Evaluate alternative for compliance with the statutory limits which requires the alternative to remain under $2 million or completed within a 12-month limit	▪ The original Action Memorandum for the Site, dated May 23, 2000 (EPA 2000a), provided the documentation required to meet the NCP section 300.415(b) criteria for a removal action. Without an exemption, fund-financed removal actions have a statutory limit of $2,000,000 and 12-month duration limit. The Action Memorandum Amendment dated May 2002 (EPA 2002), provided EPA's determination concerning the consistency exemption at the Site – that the continued response action is otherwise appropriate and consistent with the remedial action to be taken.
	Evaluate whether alternative will require off-site permits or other factors including easements, right-of-way agreements, or zoning variances	▪ No offsite removal activities would be conducted under this alternative. ▪ Activities under this alternative would require coordination between multiple government agencies including the USFS, EPA, DEQ, and DNRC.
Availability of services and materials	Availability of adequate offsite treatment, storage capacity, and disposal capacity and services	▪ This alternative does not require offsite treatment, storage, and disposal services. Thus, this criterion is not applicable.
	Availability of personnel and technology to maintain the removal schedule	▪ Technical specialists for training personnel with respect to LA exposures are available. ▪ Dedicated equipment for firefighting activities within the OU3 removal action area are available. ▪ Labor for the ground crew is generally available and can be secured with sufficient planning, time, and funding ▪ PPE required for firefighting and mop-up activities within the OU3 removal action area is available. ▪ This alternative would require the use of specialized helicopters for aerial support, but these aircrafts can be secured with sufficient planning, time, and funding. ▪ USFS has contracting mechanisms in place to secure these resources and base them within Libby.
	Availability of services and materials (i.e. laboratory testing capacity, turnaround for chemical analyses, adequate supplies and equipment for on-site activities, or installation of extra utilities)	
	Availability of prospective technologies	

Table A-8. Implementability Evaluation Summary – Alternative RA3 (continued)

Evaluation Factors for Implementability		Evaluation Summary
State (Support Agency) Acceptance	State concerns will be considered in determining the recommended alternative in the EE/CA and in the final selection of the alternative in the Action Memorandum	▪ This criterion is not directly evaluated in this EE/CA. For detailed explanation please refer to Section 4.5. However, initial feedback from DNRC indicates strong support for aggressive suppression of wildland fires within OU3, which would presumably be associated with Alternative RA3
Community Acceptance	Acceptance from the community will be considered in determining a recommendation for the EE/CA and in the final selection of the alternative in the Action Memorandum	▪ This criterion is not directly evaluated in this EE/CA. For detailed explanation please refer to Section 4.6. However, interviews have been conducted with some representatives of the community that have indicated general support for heightened fire preparedness within OU3, which show general acceptance of Alternatives RA2 and RA3 over Alternative RA1.

Table A-9. Cost Evaluation Summary – Alternative RA3

Evaluation Factors for Cost	Approximate Cost (Dollars)
Total capital cost	$8,298,000
Total annual PRSC cost	$0
Total cost (excluding present value discounting)	$8,298,000
Total present value cost	$7,781,000

Note: Total costs are for the assumed period of analysis (3 years). Costs are rounded to the nearest $1,000. The NTCRA would not involve PRSC activities that are typically performed after a NTCRA, since this NTCRA involves LA-related fire preparedness within OU3 and would continue until a remedial action is initiated for OU3.

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Appendix B

Cost

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The cost spreadsheets included in this appendix were developed in accordance with EPA 540-R-00-002 (OSWER 9355.0-75) July 2000.

These costs should be used to compare alternative relative costs. Costs for project management, removal action planning, and construction management were determined as percentages of capital cost per the guidance. Costs for these work items may not reflect costs for implementation. These costs are determined based on specific client requirements during implementation.

TABLE CS-ALT

ALTERNATIVE COST SUMMARY

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Year: 2017

Alternative		Total Capital Cost	Total PRSC Cost	Total Non-Discounted Cost	Present Value Cost
RA1	No LA-Related Fire Preparedness Activities	$0	$0	$0	$0
RA2	LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support	$6,099,000	$0	$6,099,000	$5,709,000
RA3	LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support	$8,298,000	$0	$8,298,000	$7,781,000

PRSC - Post-Removal Site Control

Notes:

1 - Capital costs, annual costs, and periodic costs are presented on Tables CS-RA1 through CS-RA3
2 - Present value analysis for each remedial alternative are provided on Tables PV-RA1 through PV-RA3
3 - The non-discounted total cost demonstrates the impact of a discount rate on the total present value cost and the relative amount of future annual expenditures. Non-discounted costs are presented for comparison purposes only and should not be used in place of present value costs in the CERCLA remedy selection process.
4 - Costs presented are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for EE/CA evaluation purposes.

Present Value and Cost Estimate Summary

TABLE PV-RA1

PRESENT VALUE ANALYSIS

Alternative RA1

No LA-Related Fire Preparedness Activities

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Year[1]	Capital Costs[2]	Annual PRSC Costs	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
1	$0	$0	$0	1.0000	$0
2	$0	$0	$0	0.9346	$0
3	$0	$0	$0	0.8734	$0
4	$0	$0	$0	0.8163	$0
5	$0	$0	$0	0.7629	$0
TOTALS:	$0	$0	$0		$0
TOTAL PRESENT VALUE OF ALTERNATIVE 1[5]					**$0**

Notes:

[1] Estimated removal timeframes (3 years from intiation of the NTCRA) are discussed within the EE/CA report. As a simplifying assumption, it is assumed that NTCRA initiation would occur in 2017 (Year 1).

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-1.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

The NTCRA would not involve PRSC activities that are typically performed after a NTCRA, since this NTCRA involves LA exposure-related fire preparedness within OU3 and would continue until a remedial action is initiated for OU3.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. The cost estimates are prepared solely to facilitate relative comparisons between alternatives for EE/CA evaluation purposes.

TABLE CS-RA1

Alternative **RA1**
No LA-Related Fire Preparedness Activities

COST ESTIMATE SUMMARY

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017
Date: March 2017

Description: Alternative RA1 assumes that standard USFS fire preparedness activities would be followed in the OU3 removal action area with no added LA-related fire preparedness activities being conducted. Alternative RA1 would not include OU3-dedicated aerial or ground resources based in Libby such as helicopters, specially trained firefighting crews, and dozers. Fires that start within the OU3 removal action area would be addressed based on standard USFS prioritization structures and resource availability. Due to absence of LA-related fire preparedness measures, this alternative would result in standard firefighting crews responding to fires within the OU3 removal action area without PPE or asbestos training. This standard response would include fire starts within the OU3 removal action area where human health risks from forest-related source media containing LA, such as duff, are the highest as illustrated in Figure 2-1, thus, exposing firefighters to elevated LA exposure risks.

CAPITAL COSTS: (Assumed to be Incurred Annually)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
					$0	
SUBTOTAL					$0	
Contingency (Scope and Bid)		5%			$0	5% Bid (unit rates based on previously incurred costs).
SUBTOTAL					$0	
Project Management		5%			$0	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
Removal Action Planning		5%			$0	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
Construction Management		5%			$0	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
TOTAL					$0	
TOTAL CAPITAL COST					**$0**	Total capital cost is rounded to the nearest $1,000.

Notes:

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for EE/CA evaluation purposes.

Abbreviations:

EA Each
LS Lump Sum
QTY Quantity

TABLE PV-RA2

PRESENT VALUE ANALYSIS

Alternative RA2

LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Year[1]	Capital Costs[2]	Annual PRSC Costs	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
1	$2,033,000	$0	$2,033,000	1.0000	$2,033,000
2	$2,033,000	$0	$2,033,000	0.9346	$1,900,042
3	$2,033,000	$0	$2,033,000	0.8734	$1,775,622
4	$0	$0	$0	0.8163	$0
5	$0	$0	$0	0.7629	$0
TOTALS:	$6,099,000	$0	$6,099,000		$5,708,664
TOTAL PRESENT VALUE OF ALTERNATIVE 2[5]					**$5,709,000**

Notes:

[1] Estimated removal timeframes (3 years from intiation of the NTCRA) are discussed within the EE/CA report. As a simplifying assumption, it is assumed that NTCRA initiation would occur in 2017 (Year 1).

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-2.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

The NTCRA would not involve PRSC activities that are typically performed after a NTCRA, since this NTCRA involves LA exposure-related fire preparedness within OU3 and would continue until a remedial action is initiated for OU3.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. The cost estimates are prepared solely to facilitate relative comparisons between alternatives for EE/CA evaluation purposes.

TABLE CS-RA2

Alternative **RA2**

LA-Related Fire Preparedness Activities for Aerial Resources with Limited Ground Support

COST ESTIMATE SUMMARY

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017
Date: March 2017

Description: Alternative RA2 includes LA-related fire preparedness through increased firefighting resources based in Libby, including OU3 aerial resources with a limited dedicated ground crew to support the aerial response. These aerial resources would allow for an aggressive initial aerial attack on fire starts within the OU3 removal action area. Normal fire preparedness activities would continue for fire starts outside the OU3 removal action area and are not evaluated in this EE/CA. Fire response, including the initial response to fires and fire suppression, is not addressed in this alternative and is outside the scope of this EE/CA. For the purposes of this EE/CA, it is assumed that period of analysis for this alternative would be a minimum of 3 years. This alternative would include added resources, above and beyond normal fire preparedness resources. Thus, additional expenses would be incurred for stationing of increased fire-related resources at Libby for heightened LA-related fire preparedness. The following increased fire-related resources are assumed to include but are not limited to:

- A helicopter would be stationed at the Libby Airport when Preparedness Levels reach PL 4 or 5 or as determined by fire managers. Similar to the 2016 TCRA (described in Section 2.8), this helicopter would be an added resource that would be brought in for use in responding to fires within the OU3 removal action area . Initially, as the PL is raised to PL 4 based on seasonal fire severity, fire activity, and firefighting resource availability, Type 2 helicopter (with a carrying capacity of up to 360 gallons) would be utilized. If the severity of the fire season warrants a higher capacity helicopter, a Type 1 helicopter (with a carrying capacity of 700 to 2,500 gallons) would be brought in to replace the Type 2 helicopter.
- A limited ground-based crew would be based in Libby to support the aerial activities. The role of the dedicated two-person fireline leadership crew during fire response activities would be to serve as observers to guide aerial activities and determine the effectiveness of extinguishing the fire but would not construct fire lines or perform mop up activities. In addition to the two-person crew, a fire manager would be based in Libby to oversee the LA-related fire activities. This ground crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.

CAPITAL COSTS: (Assumed to be Incurred During Year 2017, 2018, and 2019)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Fire Line Leadership Preparedness	CW2-1	1	LS	$140,125	$140,125	Assumes annual minimal fire preparedness requirement for OU3.
Aerial Crew Response Preparedness	CW2-2	1	LS	$1,543,500	$1,543,500	
SUBTOTAL					$1,683,625	
Contingency (Scope and Bid)		5%			$84,181	5% Bid (unit rates based on previously incurred costs).
SUBTOTAL					$1,767,806	
Project Management		5%			$88,390	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
Removal Action Planning		5%			$88,390	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
Construction Management		5%			$88,390	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
TOTAL					$2,032,976	
TOTAL CAPITAL COST					**$2,033,000**	Total capital cost is rounded to the nearest $1,000.

Notes:

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for EE/CA evaluation purposes.

Abbreviations:

LS Lump Sum
QTY Quantity

TABLE PV-RA3

PRESENT VALUE ANALYSIS

Alternative RA3

LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Year[1]	Capital Costs[2]	Annual PRSC Costs	Total Annual Expenditure[3]	Discount Factor (7.0%)	Present Value[4]
1	$2,916,000	$0	$2,916,000	1.0000	$2,916,000
2	$2,691,000	$0	$2,691,000	0.9346	$2,515,009
3	$2,691,000	$0	$2,691,000	0.8734	$2,350,319
4	$0	$0	$0	0.8163	$0
5	$0	$0	$0	0.7629	$0
TOTALS:	$8,298,000	$0	$8,298,000		$7,781,328
TOTAL PRESENT VALUE OF ALTERNATIVE 3[5]					**$7,781,000**

Notes:

[1] Estimated removal timeframes (3 years from intiation of the NTCRA) are discussed within the EE/CA report. As a simplifying assumption, it is assumed that NTCRA initiation would occur in 2017 (Year 1).

[2] Capital costs, for purposes of this analysis, are assumed to be distributed as indicated on Table CS-3.

[3] Total annual expenditure is the total cost per year with no discounting.

[4] Present value is the total cost per year including a 7.0% discount factor for that year. See Table PV-ADRFT for details.

[5] Total present value is rounded to the nearest $1,000. Inflation and depreciation are excluded from the present value cost.

The NTCRA would not involve PRSC activities that are typically performed after a NTCRA, since this NTCRA involves LA exposure-related fire preparedness within OU3 and would continue until a remedial action is initiated for OU3.

Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. The cost estimates are prepared solely to facilitate relative comparisons between alternatives for EE/CA evaluation purposes.

TABLE CS-RA3

Alternative **RA3**

LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

COST ESTIMATE SUMMARY

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017
Date: March 2017

Description: Alternative RA3 includes heightened LA-related fire preparedness through increased firefighting resources, including OU3 aerial resources and ground crew support. These dedicated aerial and ground crews would allow for an aggressive initial attack on new fire starts within the OU3 removal action area. Normal fire preparedness activities would continue for fire starts outside the OU3 removal action area and are not evaluated in this EE/CA. Fire response, including the initial response to fires and fire suppression, is not addressed in this alternative and is outside the scope of this EE/CA. For the purposes of this EE/CA, it is assumed that period of analysis for this alternative would be a minimum of 3 years. Additionally, this alternative would include added resources, above and beyond normal fire preparedness resources. Thus, additional expenses would be incurred for stationing of increased fire-related resources at Libby for heightened LA-related fire preparedness. The following increased fire-related resources are assumed to include but are not limited to:

- A helicopter would be stationed at the Libby Airport when PL reaches PL 4 or 5 or as determined by fire managers. Similar to the 2016 TCRA (described in Section 2.8), this helicopter would be an added resource that would be brought in for use in responding to fires within the OU3 removal action area. Initially, as the PL is raised to PL 4 based on seasonal fire severity, fire activity, and firefighting resource availability, a Type 2 helicopter (with a carrying capacity of up to 360 gallons) would be utilized. If the severity of the fire season warrants a higher capacity helicopter, a Type 1 helicopter (with a carrying capacity of 700 to 2,500 gallons) would be brought in to replace the Type 2 helicopter.
- A dedicated and specially trained ground-based crew would be based in Libby during the fire season to allow for initial attack of fire starts with low-moderate potential. The ground crew would be available to quickly respond on the ground to one to two new fire starts at any given time. The USFS has determined that a 10-person firefighting crew would be required for ground response given the size of the OU3 removal action area and the historical fire data (See Figure 2-2). This ground crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.
- To support the aerial and ground resources, a dedicated two-person fireline leadership crew would be based in Libby. The role of the dedicated two-person fireline leadership crew during fire response activities would be to serve as observers to guide aerial activities and determine the effectiveness of extinguishing the fire as well as commanding the ground-based crew to construct fire lines or perform mop up activities. In addition to the two-person crew, a fire manager would be based in Libby to oversee the LA-related fire preparedness activities. This crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.
- A dozer and transport equipment would also be based in Libby to support the ground-based crew. The dozer would be required to support firefighting activities such as expeditiously building fire lines. This equipment would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this equipment would be dedicated to OU3.

CAPITAL COSTS: (Assumed to be Incurred During 2017)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Fire Response Preparedness Setup	CW3-1	1	LS	$85,000	$85,000	
Fire Line Leadership Preparedness	CW3-2	1	LS	$140,125	$140,125	
Aerial Crew Response Preparedness	CW3-3	1	LS	$1,543,500	$1,543,500	
Ground Crew Response Preparedness	CW3-4	1	LS	$646,200	$646,200	
SUBTOTAL					$2,414,825	
Contingency (Scope and Bid)		5%			$120,741	5% Bid (unit rates based on previously incurred costs).
SUBTOTAL					$2,535,566	
Project Management		5%			$126,778	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
Removal Action Planning		5%			$126,778	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
Construction Management		5%			$126,778	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
TOTAL					$2,915,900	
TOTAL CAPITAL COST					**$2,916,000**	Total capital cost is rounded to the nearest $1,000.

TABLE CS-RA3

Alternative **RA3**

LA-Related Fire Preparedness Activities for Aerial Resources with Full Ground Crew Support

COST ESTIMATE SUMMARY

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017
Date: March 2017

Description: Alternative RA3 includes heightened LA-related fire preparedness through increased firefighting resources, including OU3 aerial resources and ground crew support. These dedicated aerial and ground crews would allow for an aggressive initial attack on new fire starts within the OU3 removal action area. Normal fire preparedness activities would continue for fire starts outside the OU3 removal action area and are not evaluated in this EE/CA. Fire response, including the initial response to fires and fire suppression, is not addressed in this alternative and is outside the scope of this EE/CA. For the purposes of this EE/CA, it is assumed that period of analysis for this alternative would be a minimum of 3 years. Additionally, this alternative would include added resources, above and beyond normal fire preparedness resources. Thus, additional expenses would be incurred for stationing of increased fire-related resources at Libby for heightened LA-related fire preparedness. The following increased fire-related resources are assumed to include but are not limited to:

- A helicopter would be stationed at the Libby Airport when PL reaches PL 4 or 5 or as determined by fire managers. Similar to the 2016 TCRA (described in Section 2.8), this helicopter would be an added resource that would be brought in for use in responding to fires within the OU3 removal action area. Initially, as the PL is raised to PL 4 based on seasonal fire severity, fire activity, and firefighting resource availability, a Type 2 helicopter (with a carrying capacity of up to 360 gallons) would be utilized. If the severity of the fire season warrants a higher capacity helicopter, a Type 1 helicopter (with a carrying capacity of 700 to 2,500 gallons) would be brought in to replace the Type 2 helicopter.
- A dedicated and specially trained ground-based crew would be based in Libby during the fire season to allow for initial attack of fire starts with low-moderate potential. The ground crew would be available to quickly respond on the ground to one to two new fire starts at any given time. The USFS has determined that a 10-person firefighting crew would be required for ground response given the size of the OU3 removal action area and the historical fire data (See Figure 2-2). This ground crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.
- To support the aerial and ground resources, a dedicated two-person fireline leadership crew would be based in Libby. The role of the dedicated two-person fireline leadership crew during fire response activities would be to serve as observers to guide aerial activities and determine the effectiveness of extinguishing the fire as well as commanding the ground-based crew to construct fire lines or perform mop up activities. In addition to the two-person crew, a fire manager would be based in Libby to oversee the LA-related fire preparedness activities. This crew would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this crew would be dedicated to OU3.
- A dozer and transport equipment would also be based in Libby to support the ground-based crew. The dozer would be required to support firefighting activities such as expeditiously building fire lines. This equipment would be an added resource that would be brought in to increase fire preparedness within OU3 and specifically within the OU3 removal action area. All activities related to this equipment would be dedicated to OU3.

CAPITAL COSTS: (Assumed to be Incurred During 2018 and 2019)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Fire Line Leadership Preparedness	CW3-2	1	LS	$140,125	$140,125	
Aerial Crew Response Preparedness	CW3-3	1	LS	$1,543,500	$1,543,500	
Ground Crew Response Preparedness	CW3-4	1	LS	$646,200	$646,200	
SUBTOTAL					$2,329,825	
Contingency (Scope and Bid)		5%			$116,491	5% Bid (unit rates based on previously incurred costs).
SUBTOTAL					$2,446,316	
Project Management		5%			$122,316	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
Technical Support		5%			$122,316	Low end of the recommended range from Exhibit 5-8 in EPA 540-R-00-002.
TOTAL					$2,690,948	
TOTAL ANNUAL COST					**$2,691,000**	Total annual PRSC cost is rounded to the nearest $1,000.

Notes:

Percentages used for contingency and professional/technical services costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Costs presented for this alternative are expected to have an accuracy between -30% to +50% of actual costs, based on the scope presented. They are prepared solely to facilitate relative comparisons between alternatives for EE/CA evaluation purposes.

Abbreviations:

LS Lump Sum
QTY Quantity

Cost Worksheets

TABLE CW2-1

Alternative RA2 **Cost Worksheet:** **CW2-1**
Annual Cost Sub-Element
Fire Line Leadership Preparedness

COST WORKSHEET

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Prepared By: MS **Date:** 1/19/2017
Checked By: JN **Date:** 1/28/2017

Work Statement:
This sub-element involves USFS fireline leadership dedicated to OU3 during the fire season. Asssumes basic fire preparedness only for this alternative. Includes annual medical monitoring and training for the USFS personnel.

Cost Analysis:
Cost for Fire Line Leadership Preparedness (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L1	Fire Manager/COR	115	DY	1.00	$325.00	$325.00	$0.00	$0.00	$0.00	$0.00	$325.00	$37,375.00	0%	0%	$37,375	U OU3 Crew Prep	OU3 Preparedness Costs. No respirator.
L2	Fire Manager/COR	15	DY	0.50	$325.00	$650.00	$0.00	$0.00	$0.00	$0.00	$650.00	$9,750.00	0%	0%	$9,750	U OU3 Crew Prep	Estimated 10-15 days spent in a respirator. OU3 Preparedness Costs
L3	Fireline Leadership/Contract Inspectors	160	DY	1.00	$300.00	$300.00	$0.00	$0.00	$0.00	$0.00	$300.00	$48,000.00	0%	0%	$48,000	U OU3 Crew Prep	OU3 Preparedness Costs. No respirator.
L4	Fireline Leadership/Contract Inspectors	60	DY	0.50	$300.00	$600.00	$0.00	$0.00	$0.00	$0.00	$600.00	$36,000.00	0%	0%	$36,000	U OU3 Crew Prep	Estimated 20-30 days spent in a respirator. OU3 Preparedness Costs
M3	Medical Monitoring for Forest Service Personnel	3	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$3,000.00	0%	0%	$3,000	U OU3 Crew Prep	OU3 Preparedness Costs
M4	Training/Travel	3	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,000.00	$2,000.00	$6,000.00	0%	0%	$6,000	U OU3 Crew Prep	OU3 Preparedness Costs
												TOTAL UNIT COST:			$140,125		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$140,125	$140,125

Notes:
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.

Source of Cost Data:
NA Not Applicable - costs are from previous work or vendor quote
For citation references, the following sources apply:
MII (MII Assemblies), GSA (www.gsa.gov), FLC (FLC Datacenter), A (Allowance), V (Vendor Quote), CW (Means CostWorks 2017), P (Previous Work), CB (MII English Cost Book), FRTR (www.frtr.gov), U (US Forest Service)

Abbreviations:

QTY	Quantity	DY	Days
EQUIP	Equipment	EA	Each
MATL	Material	HR	Hours
HPF	HTRW Productivity Factor	LS	Lump Sum
ADJ LABOR	Adjusted Labor for HFP	MO	Months
ADJ EQUIP	Adjusted Equipment for HFP	WK	Weeks
UNMOD UC	Unmodified Unit Cost	YR	Years
UNMOD LIC	Unmodified Line Item Cost		
UNBUR LIC	Unburdened Line Item Cost		
PC OH	Prime Contractor Overhead		
PC PF	Prime Contractor Profit		
BUR LIC	Burdened Line Item Cost		

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Level of protection will be a mixture of Level "D" PPE and Level "C" PPE based on estimated number of days.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2017 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, 31 Sep 2016
Area Cost Factor	An AF of 0.97 is used for Montana, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that Subcontractor O&P is either included in the PC O&P or has been factored into vendor quotes or previous work.
Prime Contractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%. Allowances and items with mandated costs such as per diem do not have overhead and profit applied.

TABLE CW2-2

Alternative RA2 **Cost Worksheet:** **CW2-2**
Capital Cost Sub-Element
Aerial Crew Response Preparedness

COST WORKSHEET

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Prepared By: MS **Date:** 1/19/2017
Checked By: JN **Date:** 1/28/2017

Work Statement:
When fire conditions warrant and/or during times of limited aviation resource availability the Forest Service would utilize a call when needed helicopter for OU3. Under typical fire season conditions a Type 2 helicopter, which is a medium sized helicopter, would be stationed at the Libby Helibase for a quick response. If fire season is more severe a Type 1 helicopter would be utilized in place of the Type 2 helicopter. Fire season severity varies from year-to-year and even day-to-day based on weather conditions. It is estimated that a helicopter would need to be in place from July 1st through September 15th. August is usually the peak of the fire season and the most extreme condition thus it is estimated that a Type 1 helicopter could be needed to replace the Type 2 helicopter from August 1st-September 15th.

Cost Analysis:
Cost for Aerial Crew Response Preparedness (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L8	Helicopter (Type 2 - Medium)	45	DY	1.00	$0.00	$0.00	$7,400	$7,400	$0.00	$0.00	$7,400.00	$333,000.00	0%	0%	$333,000	U OU3 Crew Prep	Includes pilot, fuel, etc. OU3 Preparedness Costs
L9	Helicopter (Type 1 - Heavy)	45	DY	1.00	$0.00	$0.00	$26,900	$26,900	$0.00	$0.00	$26,900.00	$1,210,500.00	0%	0%	$1,210,500	U OU3 Crew Prep	Includes pilot, fuel, etc. OU3 Preparedness Costs
												TOTAL UNIT COST:			$1,543,500		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$1,543,500	$1,543,500

Notes:
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.

Source of Cost Data:
NA Not Applicable - costs are from previous work or vendor quote
For citation references, the following sources apply:
MII (MII Assemblies), GSA (www.gsa.gov), FLC (FLC Datacenter), A (Allowance), V (Vendor Quote), CW (Means CostWorks 2017), P (Previous Work), CB (MII English Cost Book), FRTR (www.frtr.gov), U (US Forest Service)

Abbreviations:

QTY	Quantity	DY	Days
EQUIP	Equipment	EA	Each
MATL	Material	HR	Hours
HPF	HTRW Productivity Factor	LS	Lump Sum
ADJ LABOR	Adjusted Labor for HFP	MO	Months
ADJ EQUIP	Adjusted Equipment for HFP	WK	Weeks
UNMOD UC	Unmodified Unit Cost	YR	Years
UNMOD LIC	Unmodified Line Item Cost		
UNBUR LIC	Unburdened Line Item Cost		
PC OH	Prime Contractor Overhead		
PC PF	Prime Contractor Profit		
BUR LIC	Burdened Line Item Cost		

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Level of protection will be a mixture of Level "D" PPE and Level "C" PPE based on estimated number of days.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2016 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, 31 Sep 2016
Area Cost Factor	An AF of 0.97 is used for Montana, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that Subcontractor O&P is either included in the PC O&P or has been factored into vendor quotes or previous work.
Prime Contractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%. Allowances and items with mandated costs such as per diem do not have overhead and profit applied.

PROJECT:	OU3 EE/CA	COMPUTED BY :	MS	CHECKED BY:	JN
CLIENT:	EPA Region 8	DATE :	1/19/2017	DATE CHECKED:	1/28/2017
				WRKSHT NO.:	C2-1

Description: Calculations for the determination of quantities for Alternatve RA2. Time frame below is based on the assumed time dedicated to OU3 based on the OU3 Crew Preparedness Costs developed by the U.S. Forest Service.

Fireline Leadership Preparedness Leadership

Number of Fire Managers, EA:	1	
Number of days dedicated to OU3, DY/YR/EA:	130	
Estimated number of days spent in a respirator, DY/YR/EA:	15	*USFS estimates between 10-15 days per year*
Number of Fireline Leadership/Contract Inspectors, EA:	2	
Number of days dedicated to OU3, DY/YR/EA:	110	
Estimated number of days spent in a respirator, DY/YR/EA:	30	*USFS estimates between 20-30 days per year*
Medical Monitoring for Forest Service Personnel, EA/YR/EA:	1	
Training/Travel, EA/YR/EA:	1	

Fire Manager/COR - no respirator, DY/YR:	**115**
Fire Manager/COR - respirator, DY/YR:	**15**
Fireline Leadership/Contract Inspectors - no respirator, DY/YR:	**160**
Fireline Leadership/Contract Inspectors - respirator, DY/YR:	**60**
Medical Monitoring for Forest Service Personnel, EA/YR:	**3**
Training/Travel, EA/YR:	**3**

Aerial Crew Response Preparedness

Number of days dedicated to OU3, DY/YR:	90	
Percentage of time for Helicopter, Type 2 (medium), DY/YR:	50%	*USFS estimates between 45-90 days per year*
Percentage of time for Helicopter, Type 1 (heavy), DY/YR:	50%	

Helicopter, Type 2 (medium), DY/YR:	**45**
Helicopter, Type 1 (heavy), DY/YR:	**45**

TABLE CW3-1

Alternative RA3 **Cost Worksheet: CW3-1**
Capital Cost Sub-Element
Fire Response Preparedness Setup

COST WORKSHEET

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Prepared By: MS **Date:** 1/19/2017
Checked By: JN **Date:** 1/28/2017

Work Statement:
This sub-element involves purchase of decontamination unit and setting up facilities for fire repsonse dedicated to OU3.

Cost Analysis:
Cost for Fire Response Preparedness Setup (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC		COST SOURCE CITATION	COMMENTS
M1	Decontamination Unit	1	EA	1.00	$0.00	$0.00	$75,000	$75,000	$0.00	$0.00	$75,000.00	$75,000.00	0%	0%	$75,000	U	OU3 Crew Prep	OU3 Preparedness Costs
M5	Facilities	1	LS	1.00	$0.00	$0.00	$0	$0	$0.00	$10,000.00	$10,000.00	$10,000.00	0%	0%	$10,000	U	OU3 Crew Prep	OU3 Preparedness Costs
												TOTAL UNIT COST:			$85,000			

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$85,000	$85,000

Notes:
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.

Source of Cost Data:
NA Not Applicable - costs are from previous work or vendor quote
For citation references, the following sources apply:
MII (MII Assemblies), GSA (www.gsa.gov), FLC (FLC Datacenter), A (Allowance), V (Vendor Quote), CW (Means CostWorks 2017), P (Previous Work), CB (MII English Cost Book), FRTR (www.frtr.gov), U (US Forest Service)

Abbreviations:

QTY	Quantity	DY	Days
EQUIP	Equipment	EA	Each
MATL	Material	HR	Hours
HPF	HTRW Productivity Factor	LS	Lump Sum
ADJ LABOR	Adjusted Labor for HFP	MO	Months
ADJ EQUIP	Adjusted Equipment for HFP	WK	Weeks
UNMOD UC	Unmodified Unit Cost	YR	Years
UNMOD LIC	Unmodified Line Item Cost		
UNBUR LIC	Unburdened Line Item Cost		
PC OH	Prime Contractor Overhead		
PC PF	Prime Contractor Profit		
BUR LIC	Burdened Line Item Cost		

Cost Adjustment Checklist:

FACTOR:	**NOTES:**
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2017 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, 31 Sep 2016
Area Cost Factor	An AF of 0.97 is used for Montana, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that Subcontractor O&P is either included in the PC O&P or has been factored into vendor quotes or previous work.
Prime Contractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%. Allowances and items with mandated costs such as per diem do not have overhead and profit applied.

TABLE CW3-2

Alternative RA3 **Cost Worksheet: CW3-2**
Capital Cost Sub-Element
Fire Line Leadership Preparedness

COST WORKSHEET

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Prepared By: MS **Date:** 1/19/2017
Checked By: JN **Date:** 1/28/2017

Work Statement:
This sub-element involves USFS fireline leadership dedicated to OU3 during the fire season. Asssumes basic fire preparedness only for this alternative. Includes annual medical monitoring and training for the USFS personnel.

Cost Analysis:
Cost for Fire Line Leadership Preparedness (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L1	Fire Manager/COR	115	DY	1.00	$325.00	$325.00	$0.00	$0.00	$0.00	$0.00	$325.00	$37,375.00	0%	0%	$37,375	U OU3 Crew Prep	OU3 Preparedness Costs. No respirator.
L2	Fire Manager/COR	15	DY	0.50	$325.00	$650.00	$0.00	$0.00	$0.00	$0.00	$650.00	$9,750.00	0%	0%	$9,750	U OU3 Crew Prep	Estimated 10-15 days spent in a respirator. OU3 Preparedness Costs
L3	Fireline Leadership/Contract Inspectors	160	DY	1.00	$300.00	$300.00	$0.00	$0.00	$0.00	$0.00	$300.00	$48,000.00	0%	0%	$48,000	U OU3 Crew Prep	OU3 Preparedness Costs. No respirator.
L4	Fireline Leadership/Contract Inspectors	60	DY	0.50	$300.00	$600.00	$0.00	$0.00	$0.00	$0.00	$600.00	$36,000.00	0%	0%	$36,000	U OU3 Crew Prep	Estimated 20-30 days spent in a respirator. OU3 Preparedness Costs
M3	Medical Monitoring for Forest Service Personnel	3	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$1,000.00	$1,000.00	$3,000.00	0%	0%	$3,000	U OU3 Crew Prep	OU3 Preparedness Costs
M4	Training/Travel	3	EA	1.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,000.00	$2,000.00	$6,000.00	0%	0%	$6,000	U OU3 Crew Prep	OU3 Preparedness Costs
												TOTAL UNIT COST:			$140,125		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$140,125	$140,125

Notes:
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.

Source of Cost Data:
NA Not Applicable - costs are from previous work or vendor quote
For citation references, the following sources apply:
MII (MII Assemblies), GSA (www.gsa.gov), FLC (FLC Datacenter), A (Allowance), V (Vendor Quote), CW (Means CostWorks 2017), P (Previous Work), CB (MII English Cost Book), FRTR (www.frtr.gov), U (US Forest Service)

Abbreviations:

QTY	Quantity	DY	Days
EQUIP	Equipment	EA	Each
MATL	Material	HR	Hours
HPF	HTRW Productivity Factor	LS	Lump Sum
ADJ LABOR	Adjusted Labor for HFP	MO	Months
ADJ EQUIP	Adjusted Equipment for HFP	WK	Weeks
UNMOD UC	Unmodified Unit Cost	YR	Years
UNMOD LIC	Unmodified Line Item Cost		
UNBUR LIC	Unburdened Line Item Cost		
PC OH	Prime Contractor Overhead		
PC PF	Prime Contractor Profit		
BUR LIC	Burdened Line Item Cost		

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Level of protection will be a mixture of Level "D" PPE and Level "C" PPE based on estimated number of days.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2017 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, 31 Sep 2016
Area Cost Factor	An AF of 0.97 is used for Montana, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that Subcontractor O&P is either included in the PC O&P or has been factored into vendor quotes or previous work.
Prime Contractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%. Allowances and items with mandated costs such as per diem do not have overhead and profit applied.

TABLE CW3-3

Alternative RA3 **Cost Worksheet:** **CW3-3**
Capital Cost Sub-Element
Aerial Crew Response Preparedness

COST WORKSHEET

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Prepared By: MS **Date:** 1/19/2017
Checked By: JN **Date:** 1/28/2017

Work Statement:
When fire conditions warrant and/or during times of limited aviation resource availability the Forest Service would utilize a call when needed helicopter for OU3. Under typical fire season conditions a Type 2 helicopter, which is a medium sized helicopter, would be stationed at the Libby Helibase for a quick response. If fire season is more severe a Type 1 helicopter would be utilized in place of the Type 2 helicopter. Fire season severity varies from year-to-year and even day-to-day based on weather conditions. It is estimated that a helicopter would need to be in place from July 1st through September 15th. August is usually the peak of the fire season and the most extreme condition thus it is estimated that a Type 1 helicopter could be needed to replace the Type 2 helicopter from August 1st-September 15th.

Cost Analysis:
Cost for Aerial Crew Response Preparedness (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L8	Helicopter (Type 2 - Medium)	45	DY	1.00	$0.00	$0.00	$7,400	$7,400	$0.00	$0.00	$7,400.00	$333,000.00	0%	0%	$333,000	U OU3 Crew Prep	Includes pilot, fuel, etc. OU3 Preparedness Costs
L9	Helicopter (Type 1 - Heavy)	45	DY	1.00	$0.00	$0.00	$26,900	$26,900	$0.00	$0.00	$26,900.00	$1,210,500.00	0%	0%	$1,210,500	U OU3 Crew Prep	Includes pilot, fuel, etc. OU3 Preparedness Costs
												TOTAL UNIT COST:			$1,543,500		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$1,543,500	$1,543,500

Notes:
HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000
The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets.
The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.

Source of Cost Data:
NA Not Applicable - costs are from previous work or vendor quote
For citation references, the following sources apply:
MII (MII Assemblies), GSA (www.gsa.gov), FLC (FLC Datacenter), A (Allowance), V (Vendor Quote), CW (Means CostWorks 2017), P (Previous Work), CB (MII English Cost Book), FRTR (www.frtr.gov), U (US Forest Service)

Abbreviations:

QTY	Quantity	DY	Days
EQUIP	Equipment	EA	Each
MATL	Material	HR	Hours
HPF	HTRW Productivity Factor	LS	Lump Sum
ADJ LABOR	Adjusted Labor for HFP	MO	Months
ADJ EQUIP	Adjusted Equipment for HFP	WK	Weeks
UNMOD UC	Unmodified Unit Cost	YR	Years
UNMOD LIC	Unmodified Line Item Cost		
UNBUR LIC	Unburdened Line Item Cost		
PC OH	Prime Contractor Overhead		
PC PF	Prime Contractor Profit		
BUR LIC	Burdened Line Item Cost		

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Level of protection will be a mixture of Level "D" PPE and Level "C" PPE based on estimated number of days.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2017 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, 31 Sep 2016
Area Cost Factor	An AF of 0.97 is used for Montana, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that Subcontractor O&P is either included in the PC O&P or has been factored into vendor quotes or previous work.
Prime Contractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%. Allowances and items with mandated costs such as per diem do not have overhead and profit applied.

TABLE CW3-4

Alternative RA3 **Cost Worksheet: CW3-4**
Capital Cost Sub-Element
Ground Crew Response Preparedness

COST WORKSHEET

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Prepared By: MS **Date:** 1/19/2017
Checked By: JN **Date:** 1/28/2017

Work Statement:

Utilize a 90-day contract crew (10-person) for fire preparedness to OU3. Additional trained firefighters provided by the Forest Service would be needed to respond to fires outside of normal contract periods and be necessary to provide incident commanders and a contracting officer representative (oversight of the contractor). The Forest Service personnel would also be available to work on short and long-term management plans for OU3. Heavy equipment, such as a dozer with a lowboy for transportation, are relied upon for initial attack in OU3 for quick fireline construction. Similar to the helicopter a dozer would be available during the peak of the fire season in order to provide a rapid response to new fire starts in OU3. It is estimated that the dozer would generally be needed from August 1st-September 15th. If seasonal severity does not warrant, the dozer would not be utilized.

Cost Analysis:

Cost for Ground Crew Response Preparedness (Lump Sum)

COST DATABASE CODE	DESCRIPTION	QTY	UNIT(S)	HPF	LABOR	ADJ LABOR	EQUIP	ADJ EQUIP	MATL	OTHER	UNMOD UC	UNMOD LIC	PC OH	PC PF	BUR LIC	COST SOURCE CITATION	COMMENTS
L5	10-person Contract Crew	90	DY	1.00	$4,800.00	$4,800.00	$0	$0	$0.00	$0.00	$4,800.00	$432,000.00	0%	0%	$432,000	U OU3 Crew Prep	Estimated 25-35 days spent in a respirator. OU3 Preparedness Costs
L6	Type 6 Engine	4	MO	1.00	$0.00	$0.00	$2,700	$2,700	$0.00	$0.00	$2,700.00	$10,800.00	0%	0%	$10,800	U OU3 Crew Prep	OU3 Preparedness Costs
L7	Crew Vehicles	8	MO	1.00	$0.00	$0.00	$1,300	$1,300	$0.00	$0.00	$1,300.00	$10,400.00	0%	0%	$10,400	U OU3 Crew Prep	OU3 Preparedness Costs
L10	Dozer with Transport	45	DY	1.00	$0.00	$0.00	$3,800	$3,800	$0.00	$0.00	$3,800.00	$171,000.00	0%	0%	$171,000	U OU3 Crew Prep	Includes, mob/demob, operator, fuel, etc. OU3 Preparedness Costs
M2	Firefighting Supplies	1	LS	1.00	$0.00	$0.00	$0	$0	$10,000.00	$0.00	$10,000.00	$10,000.00	0%	0%	$10,000	U OU3 Crew Prep	OU3 Preparedness Costs
M6	Disposable Contaminated Equipment	30	DY	1.00	$0.00	$0.00	$0	$0	$400.00	$0.00	$400.00	$12,000.00	0%	0%	$12,000	U OU3 Crew Prep	OU3 Preparedness Costs
												TOTAL UNIT COST:			$646,200		

	Representative Unit Quantity	Unit(s)	Total Cost	Unit Cost
COST WORKSHEET SUMMARY	1	LS	$646,200	$646,200

Notes:

HTRW productivity factor is from Exhibit B-3 or B-4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000

The Cost Database Code is a reference code for linking with line item cost information with the cost source database and is not otherwise used within these cost worksheets.

The quantity bolded in the QTY column is the quantity selected as the representative unit quantity for this cost worksheet. If multiple quantities are bolded, the representative unit quantity is the sum of those quantities. When the LS unit is utilized, the default representative unit quantity is 1.

Source of Cost Data:

NA Not Applicable - costs are from previous work or vendor quote

For citation references, the following sources apply:

MII (MII Assemblies), GSA (www.gsa.gov), FLC (FLC Datacenter), A (Allowance), V (Vendor Quote), CW (Means CostWorks 2017), P (Previous Work), CB (MII English Cost Book), FRTR (www.frtr.gov), U (US Forest Service)

Abbreviations:

QTY	Quantity	DY	Days
EQUIP	Equipment	EA	Each
MATL	Material	HR	Hours
HPF	HTRW Productivity Factor	LS	Lump Sum
ADJ LABOR	Adjusted Labor for HFP	MO	Months
ADJ EQUIP	Adjusted Equipment for HFP	WK	Weeks
UNMOD UC	Unmodified Unit Cost	YR	Years
UNMOD LIC	Unmodified Line Item Cost		
UNBUR LIC	Unburdened Line Item Cost		
PC OH	Prime Contractor Overhead		
PC PF	Prime Contractor Profit		
BUR LIC	Burdened Line Item Cost		

Cost Adjustment Checklist:	**NOTES:**
FACTOR:	Level of protection will be a mixture of Level "D" PPE and Level "C" PPE based on estimated number of days.
H&S Productivity (labor and equipment only)	MII assembly costs include HPF adjustments.
Escalation to Base Year	2017 cost sources are not escalated (EF=1.00). All other costs are escalated based on the USACE CWCCIS, EM 1110-2-1304, 31 Sep 2016
Area Cost Factor	An AF of 0.97 is used for Montana, except that an AF of 1.00 (national unmodified average) is used for MII assembly costs and local vendor quotes.
Subcontractor Overhead and Profit	It is assumed that Subcontractor O&P is either included in the PC O&P or has been factored into vendor quotes or previous work.
Prime Contractor Overhead and Profit	It is assumed that home office OH is 8% and profit is 9% for the Prime Contractor. Professional labor overhead is 100%. Allowances and items with mandated costs such as per diem do not have overhead and profit applied.

PROJECT:	OU3 EE/CA	COMPUTED BY :	MS	CHECKED BY:	JN
CLIENT:	EPA Region 8	DATE :	1/19/2017	DATE CHECKED:	1/28/2017
				WRKSHT NO.:	C3-1

Description: Calculations for the determination of quantities for Alternatve RA3. Time frame below is based on the assumed time dedicated to OU3 based on the OU3 Crew Preparedness Costs developed by the U.S. Forest Service.

Capital Costs

Decontamination Unit, EA:	1	
Facilities, LS:	1	

Fireline Leadership Preparedness Leadership

Number of Fire Managers, EA:	1	
Number of days dedicated to OU3, DY/YR/EA:	130	
Estimated number of days spent in a respirator, DY/YR/EA:	15	*USFS estimates between 10-15 days per year*
Number of Fireline Leadership/Contract Inspectors, EA:	2	
Number of days dedicated to OU3, DY/YR/EA:	110	
Estimated number of days spent in a respirator, DY/YR/EA:	30	*USFS estimates between 20-30 days per year*
Medical Monitoring for Forest Service Personnel, EA/YR/EA:	1	
Training/Travel, EA/YR/EA:	1	
Fire Manager/COR - no respirator, DY/YR:	**115**	
Fire Manager/COR - respirator, DY/YR:	**15**	
Fireline Leadership/Contract Inspectors - no respirator, DY/YR:	**160**	
Fireline Leadership/Contract Inspectors - respirator, DY/YR:	**60**	
Medical Monitoring for Forest Service Personnel, EA/YR:	**3**	
Training/Travel, EA/YR:	**3**	

Aerial Crew Response Preparedness

Number of days dedicated to OU3, DY/YR:	90	
Percentage of time for Helicopter, Type 2 (medium), DY/YR:	50%	*USFS estimates between 45-90 days per year*
Percentage of time for Helicopter, Type 1 (heavy), DY/YR:	50%	
Helicopter, Type 2 (medium), DY/YR:	**45**	
Helicopter, Type 1 (heavy), DY/YR:	**45**	

Ground Crew Response Preparedness

Contract crew, EA:	10	
Number of days dedicated to OU3, DY/YR/EA:	90	
Estimated number of days spent in a respirator, DY/YR/EA:	30	*USFS estimates between 25-35 days per year*
Number of Type 6 Engine, EA:	1	
Type 6 Engine dedicated to OU3, MO/YR/EA:	4	
Number of Crew Vehicles, EA:	2	
Crew Vehicles dedicated to OU3, MO/YR/EA:	4	
Number of dozer, EA:	1	
Dozer dedicated to OU3, DY/YR/EA:	45	
Firefighting Supplies, LS/YR/EA:	1	

PROJECT:	OU3 EE/CA	**COMPUTED BY :**	MS	**CHECKED BY:**	JN
CLIENT:	EPA Region 8	**DATE :**	1/19/2017	**DATE CHECKED:**	1/28/2017
				WRKSHT NO.:	C3-1

Description: Calculations for the determination of quantities for Alternatve RA3. Time frame below is based on the assumed time dedicated to OU3 based on the OU3 Crew Preparedness Costs developed by the U.S. Forest Service.

Disposable Contaminated Equipment, DY/YR/EA:	1

10-person Contract Crew, DY/YR:	**90**
Type 6 Engineer, MO/YR:	**4**
Crew vehicles, MO/YR:	**8**
Dozer with Transport, DY/YR:	**45**
Firefighting Supplies, LS/YR:	**1**
Disposable Contaminated Equipment, DY/YR:	**30**

Cost Estimate Backup

TABLE PV-ADRFT

PRESENT VALUE ANALYSIS

Annual Discount Rate Factors Table

Site: Libby Asbestos Superfund Site - OU3
Location: Lincoln County, Montana
Phase: Engineering Evaluation / Cost Analysis
Base Year: 2017

Discount Rate (Percent): 7.0

Year	Discount Factor[1,2]	Year	Discount Factor[1,2]
0	1.0000	26	0.1722
1	0.9346	27	0.1609
2	0.8734	28	0.1504
3	0.8163	29	0.1406
4	0.7629	30	0.1314
5	0.7130	31	0.1228
6	0.6663	32	0.1147
7	0.6227	33	0.1072
8	0.5820	34	0.1002
9	0.5439	35	0.0937
10	0.5083		
11	0.4751		
12	0.4440		
13	0.4150		
14	0.3878		
15	0.3624		
16	0.3387		
17	0.3166		
18	0.2959		
19	0.2765		
20	0.2584		
21	0.2415		
22	0.2257		
23	0.2109		
24	0.1971		
25	0.1842		

Notes:

[1] Annual discount factors were calculated using the formulas and guidance presented in Section 4.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.

[2] The real discount rate of 7.0% was obtained from "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000, Page 4-5.

COST INDICES FOR ESCALATION

Base Year for Work: **2017**

Year	Cost Index[1]
2000	497.07
2001	503.52
2002	517.46
2003	529.95
2004	571.29
2005	608.36
2006	641.91
2007	673.52
2008	716.54
2009	703.00
2010	724.17
2011	756.48
2012	773.75
2013	787.64
2014	804.05
2015	804.97
2016	812.19
2017	832.14
2018	847.12
2019	864.06
2020	881.34
2021	898.97
2022	916.95
2023	935.28
2024	953.99
2025	973.07

1 Yearly composite cost index (weighted average) from the U.S. Army Corps of Engineers Civil Works Construction Cost Index System (CWCCIS), EM 1110-2-1304, 31 March 2000. Revised as of 30 September 2016.

FLC Data Center

Base Year: 2017

COST CODES FOR LABOR AND UNIT COSTS

Cost Code	Description	Units	Unit Labor Cost	Unit Equipment Cost	Unit Material Cost	Unit Other Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted Labor Cost	Adjusted Equipment Cost	Adjusted Material Cost	Adjusted Other Cost	PC OH	PC PF	Cost Source		Comments
																Source	Source ID	
L1	Fire Manager/COR	DY	$325.00	$0.00	$0.00	$0.00	2017	1	1	$325.00	$0.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs. No respirator.
L2	Fire Manager/COR	DY	$325.00	$0.00	$0.00	$0.00	2017	1	1	$325.00	$0.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	Estimated 10-15 days spent in a respirator. OU3 Preparedness Costs
L3	Fireline Leadership/Contract Inspectors	DY	$300.00	$0.00	$0.00	$0.00	2017	1	1	$300.00	$0.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs. No respirator.
L4	Fireline Leadership/Contract Inspectors	DY	$300.00	$0.00	$0.00	$0.00	2017	1	1	$300.00	$0.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	Estimated 20-30 days spent in a respirator. OU3 Preparedness Costs
L5	10-person Contract Crew	DY	$4,800.00	$0.00	$0.00	$0.00	2017	1	1	$4,800.00	$0.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	Estimated 25-35 days spent in a respirator. OU3 Preparedness Costs
L6	Type 6 Engine	MO	$0.00	$2,700.00	$0.00	$0.00	2017	1	1	$0.00	$2,700.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs
L7	Crew Vehicles	MO	$0.00	$1,300.00	$0.00	$0.00	2017	1	1	$0.00	$1,300.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs
L8	Helicopter (Type 2 - Medium)	DY	$0.00	$7,400.00	$0.00	$0.00	2017	1	1	$0.00	$7,400.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	Includes pilot, fuel, etc. OU3 Preparedness Costs
L9	Helicopter (Type 1 - Heavy)	DY	$0.00	$26,900.00	$0.00	$0.00	2017	1	1	$0.00	$26,900.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	Includes pilot, fuel, etc. OU3 Preparedness Costs
L10	Dozer with Transport	DY	$0.00	$3,800.00	$0.00	$0.00	2017	1	1	$0.00	$3,800.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	Preparedness Costs

Base Year: 2017

COST CODES FOR MATERIAL AND UNIT COSTS

Cost Code	Description	Units	Unit Labor Cost	Unit Equipment Cost	Unit Material Cost	Unit Other Cost	Year of Cost Source	Escalation Factor	Area Factor	Adjusted Labor Cost	Adjusted Equipment Cost	Adjusted Material Cost	Adjusted Other Cost	PC OH	PC PF	Cost Source		Comments
																Source	Source ID	
M1	Decontamination Unit	EA	$0.00	$75,000.00	$0.00	$0.00	2017	1	1	$0.00	$75,000.00	$0.00	$0.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs
M2	Firefighting Supplies	LS	$0.00	$0.00	$10,000.00	$0.00	2017	1	1	$0.00	$0.00	$10,000.00	$0.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs
M3	Medical Monitoring for Forest Service Personnel	EA	$0.00	$0.00	$0.00	$1,000.00	2017	1	1	$0.00	$0.00	$0.00	$1,000.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs
M4	Training/Travel	EA	$0.00	$0.00	$0.00	$2,000.00	2017	1	1	$0.00	$0.00	$0.00	$2,000.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs
M5	Facilities	LS	$0.00	$0.00	$0.00	$10,000.00	2017	1	1	$0.00	$0.00	$0.00	$10,000.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs
M6	Disposable Contaminated Equipment	DY	$0.00	$0.00	$400.00	$0.00	2017	1	1	$0.00	$0.00	$400.00	$0.00	0%	0%	U	OU3 Crew Prep	OU3 Preparedness Costs