EPA

Coeur d'Alene Basin

PROPOSED PLAN

October 29, 2001

The Proposed Plan includes a summary of all of the cleanup alternatives that were evaluated and a description of the proposed interim action. EPA is accepting written comments on the Proposed Plan for 30 days, from October 29, 2001 through November 28, 2001. EPA will publish a notification if the comment period is extended.

Where to Send Comments

Written comments on the Proposed Plan should be directed to:

Sheila Eckman, Coeur d'Alene Team Leader
U.S. Environmental Protection Agency
1200 6th Avenue, MS ECL-113
Seattle, WA 98101

In addition, you may provide oral or written comments on the Proposed Plan at the public meetings listed below.

Proposed Plan Public Meetings

November 13th (Tuesday)
Wallace High School
Miners Auditorium
401 River Street
Wallace, Idaho

November 14th (Wednesday)
Canyon Elementary School
E. 27405 Schoolhouse Loop
(1.5 miles east of the Rose Lake exit off I-90)
Cataldo, Idaho

November 15th (Thursday)
Coeur d'Alene Inn
414 W. Appleway
Coeur d'Alene, Idaho

November 19th (Monday)
Spokane Public Works Building
(in the Commissioners Hearing Room)
1026 W. Broadway (next to the Spokane County Courthouse)
Spokane, WA

People wishing to provide oral comments will be called upon in the order in which they have signed in. Comment cards will also be available for those who would like to submit written comments at the meetings.

Where to Review the Proposed Plan and Administrative Record

You can review the Proposed Plan and supporting documents at the following information repositories and on EPA's website

Harrison City Hall
P.O. Box 73
Harrison, ID 83833
208-689-3212
Contact: Ms. Sheila Gustin

North Idaho College Library
(Contains the entire Administrative Record)
1000 Garden Avenue
Coeur d'Alene, ID 83814
208-769-3355
Contact: Ms. Ann Johnston

Spokane Public Library
906 West Main Avenue
Spokane, WA, 99201-0976
509-626-5336
Contact: Ms. Dana Dalrymple

Wallace Public Library
415 River Street
Wallace, ID 83873
208-752-4571
Contact: Ms. Bernie Ludwick

Coeur d'Alene Field Office
1910 Northwest Boulevard, Suite 208
Coeur d'Alene, ID 83814
208-664-4588
Contact: Dick Martindale

EPA Seattle Office
(Contains the entire Administrative Record)
1200 6th Avenue
Seattle, WA 98101
206-553-4494
Contact:Superfund Records Center

EPA's Website:
http://yosemite.epa.gov/r10/cleanup.nsf/sites/cda

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1.0 PROPOSED PLAN

This Proposed Plan (the Plan) presents the recommended approach for the cleanup of historic mining contamination in the Coeur d'Alene Basin (Figure 1-1), which has been defined for the **Remedial Investigation/Feasibility Study*** (RI/FS) to include the Coeur d'Alene River and associated tributaries (including the portions of the South Fork that run through the former Bunker Hill smelter area and adjacent communities ["the **Bunker Hill Box**"]), Coeur d'Alene Lake, and the Spokane River downstream to the Washington State Highway 25 bridge at the Spokane Arm of Lake Roosevelt. Although part of the Basin and a major source of dissolved metals, the Bunker Hill Box is not part of the Plan because it is already the subject of ongoing remedial actions. EPA will integrate actions in the Bunker Hill Box with those described in this Plan to effectively clean up the Coeur d'Alene Basin.

The Plan summarizes all cleanup approaches evaluated by EPA and identifies EPA's proposed Preferred Alternative. The Preferred Alternative is an interim response action. In addition, the Plan describes long-term cleanup actions thought necessary for protection of human health and the environment and compliance with **applicable or relevant and appropriate requirements** (ARARs).

Due to the very large size and complex nature of the Coeur d'Alene Basin, it was separated into four major components in the RI/FS. These components are:

- Human health risks in community and residential areas, including soil, drinking water, house dust, and aquatic food sources
- Environmental risks in the **Upper Basin and Lower Basin**, including human health benefits for recreational and subsistence users
- Coeur d'Alene Lake
- Spokane River

1.1 THE INTERIM ACTION

At this time, EPA is proposing an interim action that consists of a first increment of cleanup. It includes the complete remedy for protection of human health in the communities and residential areas of the Upper Basin and Lower Basin, as well as for the Spokane River upstream of Upriver Dam.

* Terms in bold are defined in the glossary in Section 11.0.

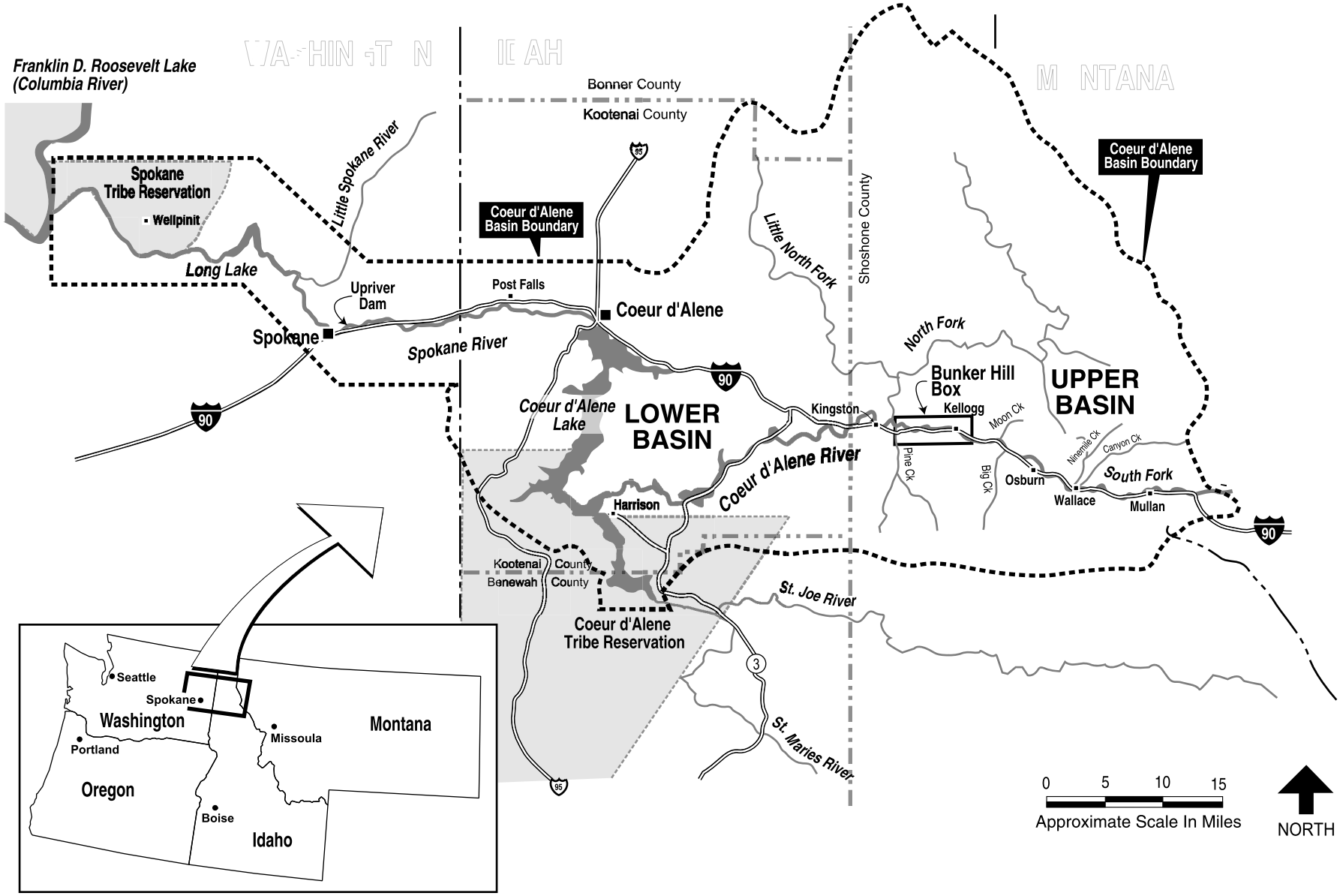

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Figure 1-1

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Site Map

For environmental protection, the interim action identifies 20 to 30 years of prioritized actions in areas of the Basin upstream of Coeur d'Alene Lake. It also includes cleanup of Spokane River sites between the Washington/Idaho border and Upriver Dam. The Plan discusses recommendations for addressing environmental issues related to Coeur d'Alene Lake.

EPA is proposing this incremental approach because the specific sources of metals contamination impacting the streams and floodplains, as well as the effectiveness of certain possible remedial actions, are not yet fully understood in some areas of the Basin. An incremental approach would use existing information and information learned from experience as subsequent increments are implemented. This approach is expected to be a cost-effective means for achieving protection of the environment.

EPA is issuing this Proposed Plan as part of its public participation process under Section 300.430(f)(2) of the **National Oil and Hazardous Substances Contingency Plan** (NCP). This Plan summarizes information that can be found in greater detail in the Coeur d'Alene Basin RI/FS reports and other documents contained in the Administrative Record file for this site. The public is encouraged to review these documents to gain a more comprehensive understanding of the site. (See the cover page for the location of the Administrative Record.) The chronology of the Coeur d'Alene Basin documents is shown in Table 1-1.

Table 1-1
Chronology of Coeur d'Alene Basin Documents

Document	Public Review Period	Final Release Date
Ecological Risk Assessment	August 2000 to November 2000	May 2001
Human Health Risk Assessment	July 2000 to October 2000	July 2001
Remedial Investigation	October 2000 to March 2001	October 2001
Feasibility Study	December 2000 to April 2001	October 2001

This Proposed Plan was developed in consultation with the Idaho Department of Environmental Quality (IDEQ), the Washington Department of Ecology, the Coeur d'Alene and Spokane Tribes, and the federal Natural Resource Trustees (the Fish and Wildlife Service, the Bureau of Land Management, and the Forest Service) and others.

EPA, in consultation with the other government agencies, will select an interim remedy after reviewing and considering all information submitted during a 30-day public comment period. If requested, EPA will extend the public comment period by an additional 30 days in accordance with Superfund regulations. Because of the complexity of the site, EPA released draft documents for public review throughout the RI/FS process, as noted above. EPA also provided updates in fact sheets and public workshops during the development of the interim action in preparation for this formal public comment period on the interim action.

The selected remedy may be a modification of the interim action or another remedy, based on new information or public comments. Therefore, the public is encouraged to review and comment on *all* alternatives and the cleanup priorities presented in this plan.

Following the public review of the Plan and supporting information in the RI/FS and the Administrative Record, EPA will consider the comments received and will select a remedy and document this remedy selection in a **Record of Decision** (ROD). The ROD also includes the Responsiveness Summary with responses to the comments received during the public comment period. The ROD will form the basis for remedial design and construction, the latter termed remedial action. The **Comprehensive Environmental Response, Compensation, and Liability Act** (CERCLA, commonly known as Superfund) process is shown in Figure 1-2.

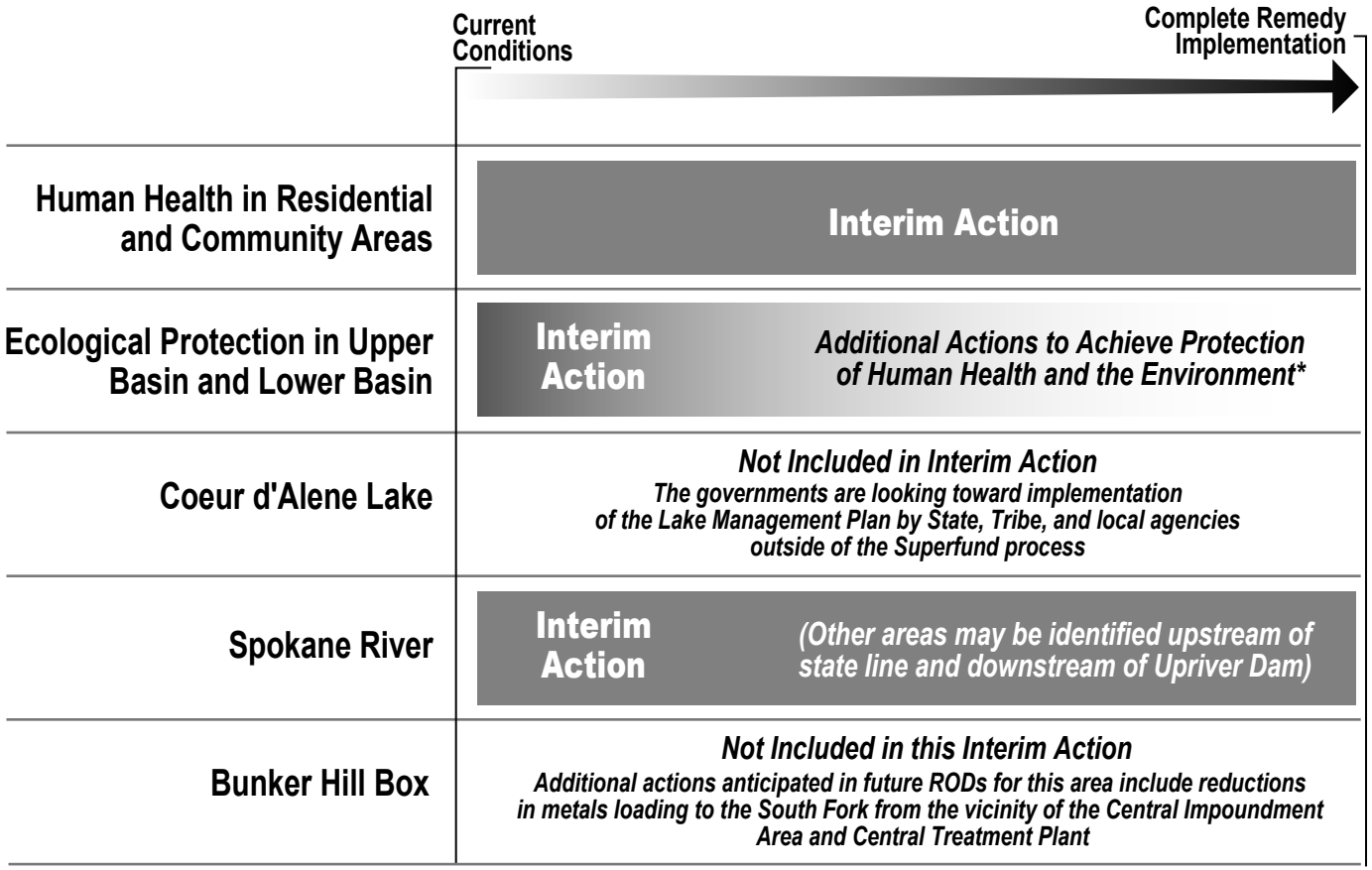
1.2 LONG-TERM CLEANUP

The interim action includes the complete remedy for protection of human health in the communities and residential areas of the Basin upstream of Coeur d'Alene Lake as well as for the Spokane River upstream of Upriver Dam. Based on existing information, EPA believes the level of cleanup effort, described in this document as Ecological Alternative 3, will be needed to achieve the long-term goals of the protection of the environment and compliance with ARARs. This alternative includes numerous cleanup tasks followed by a long period of natural recovery.

The proposed interim action for environmental protection consists of 20 to 30 years of prioritized Ecological Alternative 3 actions. The cleanup effectiveness of the interim action will be monitored throughout its duration. During implementation of the interim action, EPA will evaluate what additional increments (including specific cleanup actions) are needed to achieve the long-term cleanup goals. EPA intends to implement incrementally, in subsequent decision documents, Ecological Alternative 3 or a remedy that complies with ARARs and is as protective of human health and the environment as Ecological Alternative 3. The increments may overlap when appropriate to expedite achievement of overall protection and compliance with ARARs. The relationship between the long-term cleanup actions and those included in the interim action is shown in Figure 1-3.

The interim action includes the full remedy needed to protect humans from exposures that currently occur in the community and residential areas of the Upper Basin and Lower Basin, as well as at Spokane River recreational sites upstream of Upriver Dam. There are some current

Ecological
Risk Assessment
May 2001
Human Health
Risk Assessment
July 2001
Remedial Investigation
October 2001
Feasibility Study
October 2001
Proposed Plan
Comment Period
Ends November 28
We Are
Here
Record of Decision
Remedial Design/
Remedial Actions



*Based on existing information, EPA believes these actions would be those described by FS Ecological Alternative 3

Figure 1-3

Relationship of Interim Action to Complete Remedy Implementation

human health exposures outside of these areas, as well as some potential future exposures, that are not completely addressed. The following exposures would be addressed in future increments:

- Recreational use at all areas of potential use in the Upper Basin and Lower Basin
- Subsistence lifestyles, such as those traditional to the Coeur d'Alene and Spokane Tribes
- Potential future use of groundwater that is presently contaminated with metals

2.0 SITE BACKGROUND

Mining within the Coeur d'Alene Basin began more than 100 years ago. Mining-related activities were concentrated in the Upper Basin. The Bureau of Land Management (BLM) has mapped more than 1,000 mining or milling-related features in the Upper Basin, not all of which are sources of contamination.

Mining, milling, and smelting practices have resulted in substantial portions of the Basin containing elevated concentrations of metals that are potentially hazardous to humans and to plants and animals (collectively termed "ecological receptors"). The primary metals of concern include lead and arsenic for human health and cadmium, lead, and zinc for ecological receptors.

Mining-related activities in the Basin generated tailings (the part of the ore from which economical concentrations of metals cannot be recovered), waste rock (non-ore rock excavated from a mine), concentrates, and smelter emissions. These sources contain hazardous substances including arsenic, cadmium, lead, and zinc. In addition, the water that drains from many abandoned adits, as well as seeps, contains elevated levels of these metals.

Until 1968, most tailings were discharged directly into the South Fork or its tributaries. Since 1968, tailings have been impounded or placed back in the mines, and current mining practices contribute relatively little to the Coeur d'Alene River system compared to existing contamination resulting from pre-1968 practices. An estimated 62 million tons of tailings were discharged to streams prior to 1968. These tailings contained an estimated 880,000 tons of lead and more than 720,000 tons of zinc. Most of the tailings were transported downstream, particularly during high-flow events, and deposited as lenses of tailings or as tailings and sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Upper and Lower Basins and in Coeur d'Alene Lake. Some fine-grained material washed through the lake and was deposited as sediment within the Spokane River flood channel. The estimated total mass and extent of contaminated materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres.

In addition to transport in water, mining waste was spilled from railroad cars during transport of ore and concentrates along the railroad lines, was used as fill material for construction of roads, railroads, and structures, and was transported as airborne dust.

Many cleanup actions have been conducted at source areas and at depositional areas throughout the Basin. These actions have occurred from 1989 to the present and have been conducted by the mining companies, Union Pacific Railroad (UPRR), various state and federal agencies, and the Coeur d'Alene Tribe. The mining companies and government agencies have worked in concert on many of these actions. For example, cleanup activities have been conducted by the Silver Valley Natural Resource Trustees (SVNRT), a cooperative effort of the IDEQ and the mining companies. Many of the cleanup actions have taken place in the Bunker Hill Box, the site of some of the highest levels of contamination in the Basin. The results of that cleanup will reduce

the time needed to achieve cleanup goals for the Basin and the potential for recontamination in downstream areas.

In addition to their involvement in cleanup efforts taken to date, the mining companies have prepared a cleanup plan for the Basin. This cleanup plan was evaluated in the process of developing the interim action.

3.0 SITE CHARACTERISTICS

The Basin includes areas within Shoshone, Kootenai, and Benewah counties in Idaho and Spokane and Stevens counties in Washington. The majority of the population of the Basin lives in the cities of Spokane, Coeur d'Alene, and Post Falls, which have populations exceeding 177,000, 24,000, and 7,000 people, respectively. All other communities in the Basin have populations less than 2,000. In Kootenai and Shoshone counties, over 38 percent of the total population is in rural areas.

Land use includes residential, commercial, light industrial, agriculture, mining, and recreation. The I-90 freeway generally parallels the South Fork of the Coeur d'Alene River from Cataldo east to the Idaho/Montana border. The Union Pacific Railroad right-of-way parallels the entire length of the river as well as a portion of the southern lake shore. The inactive rail line is currently being remediated and converted to a recreational trail.

Much of the Basin is rural, undeveloped land, a large part of which is federally or state-managed. These undeveloped lands and the numerous streams in the Basin provide abundant recreation opportunities.

The Basin is the ancestral home of the Coeur d'Alene and Spokane Tribes. Coeur d'Alene reservation lands are present in the Lower Basin, and Spokane reservation lands are adjacent to the lower Spokane River. Subsistence lifestyles have been practiced in the past and are a potential future land use in the Basin; however, this lifestyle cannot currently be safely practiced due to the extent of contamination in the Basin. The Coeur d'Alene Tribe currently advises its members not to use these resources for subsistence.

Groundwater and surface water are used as drinking water sources in the Basin. Within the Upper Basin and Lower Basin, about 57 percent of residences obtain water from a public source and 43 percent obtain water from a private source. Groundwater occurs in the sand and gravel present in the stream valleys of the Upper Basin ("valley fill aquifers"), in discontinuous sand and gravel layers in the Lower Basin, and in fractures in bedrock. Some private drinking water wells obtain water from the shallow aquifers that contain elevated levels of metals. The Rathdrum Prairie Aquifer, a sole-source aquifer, is present in Spokane County.

3.1 NATURE AND EXTENT OF CONTAMINATION

From 1997 through 2001, EPA collected data and conducted a Remedial Investigation/Feasibility Study for the Basin. The RI/FS identified the types, quantities, and locations of contaminants and developed cleanup alternatives to address the contamination problems.

More than 10,000 samples were collected to support the RI/FS. These samples, combined with the 7,000 additional samples collected independently by IDEQ, USGS, the mining companies,

EPA, under other regulatory programs (e.g., the National Pollution Discharge Elimination System), and others, provide a solid basis to support informed risk management decisions for Coeur d'Alene Basin mining waste contamination. However, the large geographic area of the Basin made it impractical to collect sufficient data to fully characterize each source area or watershed. Further data collection will be necessary to support remedial design for areas identified as requiring cleanup. This may include areas where previous cleanup actions have taken place, such as floodplain areas of the UPRR right-of-way or other areas where previous removal actions have addressed some, but not all, of the contamination present.

Human Health

In the affected communities and residential areas, the primary media of concern for human health are:

- Contaminated soil in residential yards, street rights-of-way, commercial and undeveloped properties, and common areas, and airborne dust generated at these locations
- Contaminated house dust, originating primarily from contaminated soil; interior house paint is also a source of lead
- Drinking water from local wells or surface water
- Contaminated fish
- Homegrown vegetables
- Contaminated floodplain soil, sediments, and vegetation

Table 3-1 summarizes the estimated number of residences where concentrations of metals in yard soil and drinking water exceed potential cleanup levels.

Ecological

Contaminated media that potentially affect ecological receptors are surface water, soil, and sediment. In addition, groundwater is an important pathway for migration of metals to surface water.

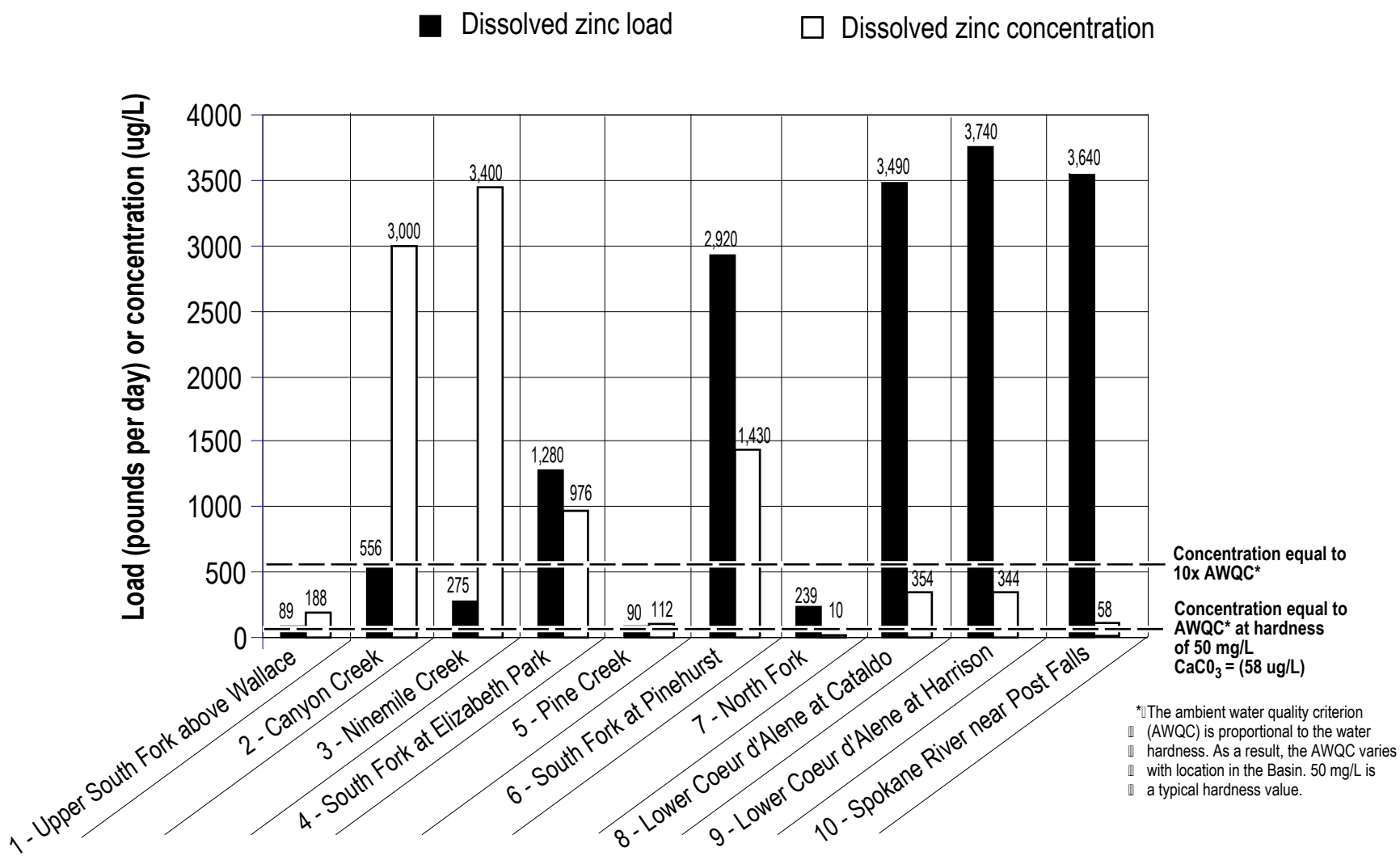
In the Upper Basin, the major sources of metals in the river system are floodplain sediments that have been intermixed with tailings. Groundwater flowing through the sediments becomes contaminated with metals and then is discharged into the river system. A portion of the metals in the groundwater have been redeposited within the aquifer materials and now serve as a secondary source of metals in groundwater. In addition, water is readily interchanged between the streams and the floodplain sediments, which enhances the rate at which metals are flushed

from the sediments into the streams. A total of about 7,100,000 cubic yards (cy) of contaminated sediments are present in the Upper Basin outside of the Bunker Hill Box. About 3,000,000 cy of these sediments are considered to be "inaccessible" for excavation because they are beneath the I-90 embankment, other roads, or residential or commercial development. A total of nearly 3,000 acres of the Upper Basin have been disturbed by mining activities.

Erosion of the river bank and bed sediments is the major source of particulate metals, particularly lead, in the Coeur d'Alene River. In the Lower Basin, wetland, floodplain, and lateral lake sediments are the major source of metals ingested by waterfowl and other animals. There are over 18,000 acres of these sediments that contain more than 530 mg/kg of lead, a concentration identified by the USFWS as the **lowest observed adverse effects level** (LOAEL) for waterfowl. The Lower Basin includes the Cataldo/Mission Flats area, where tailings were dredged from the river and placed within the floodplain. An estimated 13,600,000 cy of tailings-impacted dredge spoils cover about 680 acres at this location.

A large volume of metals-impacted sediment has been deposited in Coeur d'Alene Lake. There are an estimated 40 million to 50 million cubic yards of contaminated sediments at the bottom of the lake. On an annual basis, the lake currently acts as a sink for metals (i.e., more lead, cadmium, and zinc are deposited in the lake sediments than are released). The rate of release of metals from the sediments into the water column could increase if the lake water quality deteriorates due to nutrient enrichment.

Estimated average metals concentrations and loads (the amount in pounds per day of metal transported in a stream) were calculated from all surface water data collected from 1991 to 1999. Zinc (Figure 3-1) is present primarily in the dissolved form in surface water and occurs largely as a result of the discharge of groundwater into surface water. The **ambient water quality criterion** (AWQC) for zinc is also shown. The AWQC were developed by EPA, and are set to protect approximately 95 percent of aquatic species. The figure shows that zinc concentrations are substantially greater than 10 times the AWQC in parts of the South Fork and some of its major tributaries. Canyon Creek and Ninemile Creek are tributaries that contribute the most dissolved metals to the Coeur d'Alene River system.



Note: Estimates based on analysis of available data

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Figure 3-1

Coeur d'Alene Basin RI/FS
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Estimated Average Values of Dissolved Zinc Loads and Concentrations (1991-1999 Data)

RRB4

Table 3-1
Extent of Contamination in the Affected Communities

Community/ Area	Total Number of Residences	Estimated Number of Residences Exceeding Potential Lead Cleanup Goals				Estimated Number of Private Wells Exceeding Drinking Water MCLs
		Soil Cleanup Goal = 700 mg/kg		Soil Cleanup Goal = 1,000 mg/kg		
Mullan	548	252	46%	181	33%	1
Burke/Ninemile	245	146	60%	110	45%	4
Wallace	649	396	61%	253	39%	0
Silverton	360	70	19%	36	10%	1
Osburn	847	199	23%	105	12%	1
Side Gulches	624	131	21%	50	8%	7
Kingston	503	78	16%	65	13%	79
Lower Basin	821	107	13%	107	13%	80
Totals	4597	1379	30%	907	20%	173

Notes:
MCL = maximum contaminant level
mg/kg = milligram per kilogram

4.0 SUMMARY OF SITE RISKS

As part of the RI/FS, baseline risk assessments were conducted to estimate the current and potential future effects of metals on human health (the human health risk assessment or "HHRA") and the environment (the ecological risk assessment, or "EcoRA").

4.1 HUMAN HEALTH RISKS

The primary human health concern is blood lead levels in children. In 1991, the United States Centers for Disease Control and Prevention (CDC) determined that:

> *New data indicate significant adverse effects of lead exposure in children at blood lead levels previously believed to be safe. Some adverse health effects have been documented at blood lead levels at least as low as 10 µg/dL of whole blood. Primary prevention efforts (that is, elimination of lead hazards before children are poisoned) must receive more emphasis as the blood lead levels of concern are lowered.*

The importance of primary prevention of lead exposure has been highlighted by recent studies indicating adverse health effects at blood lead levels below 10 µg/dL. Other studies have shown that clinical treatment for elevated blood levels in children lowered blood lead levels, but did not improve cognitive function compared to untreated children. (For further information on blood lead levels in children refer to the list of related literature in Section 12.0 of this Proposed Plan.)

Children were tested in the Upper Basin communities and in areas of the Lower Basin. Elevated blood lead levels have not been found in children in the cities of Coeur d'Alene, Post Falls, and other communities downstream of the mouth of the Coeur d'Alene River. The percentage of children tested in the Basin whose blood lead levels exceeded 10 µg/dL is shown in Table 4-1. Twenty-six percent of the two-year-olds tested in the years 1996 to 2000 had blood lead levels above the CDC standard of 10 µg/dL, and 17 percent of those children exceeded 15 µg/dL. Although there is some variability in the data, the composite data from 1996 to 2000 is comparable overall to the blood lead data collected in 2000 alone.

The human health risk assessment conducted for the Basin showed that, for most children in affected communities, the home is the largest source of lead exposure. Within the home, house dust (much of which originates from soil tracked into the home) is the major source of lead exposure, followed by outdoor soil. The lead comes from mining-related material and lead paint. Drinking water and diet, including homegrown vegetables, contribute comparatively little to lead exposure in the home for most children.

Table 4-1
Blood Lead Levels in 1- to 6-Year-Old Children in the Affected Communities in the Coeur d'Alene Basin, Excluding the Bunker Hill Box

Age (years)	1996 to 2000 Data			2000 Data Only		
	No. of Children Tested	Percent of Children =10 µg/dL	Percent of Children = 15 µg/dL	No. of Children Tested	Percent of Children =10 µg/dL	Percent Children = 15 µg/dL
1	40	20.0	5.0	18	16.7	11.1
2	46	26.1	17.4	13	15.4	0
3	52	19.2	7.7	18	11.1	5.6
4	57	12.3	5.3	14	21.4	7.1
5	62	8.1	3.2	14	21.4	0
6	46	6.5	2.2	25	4.0	0

There are also risks to recreational and subsistence users in the Lower Basin. These exposures include, but are not limited to, recreating on contaminated beaches, swimming in the Coeur d'Alene River, gathering and eating water potatoes and other tribal cultural plants throughout the wetlands, and eating large amounts of fish. The beaches adjacent to the Coeur d'Alene Lake have been sampled and found to be safe for recreational use (with the exception of Harrison Beach). The State of Washington is very concerned about the risks to recreational users along the Spokane River. These exposures include consumption of fish and contaminated sediment at beaches. Risks to tribal members practicing subsistence lifestyles within the Spokane Reservation have been suggested but not quantified.

4.2 ECOLOGICAL RISKS

Most watersheds in which mining has occurred and a large portion of the Basin downgradient of mining areas are ecologically degraded. This ecological degradation has resulted in demonstrated, observable effects in the Basin. In addition, the results of the EcoRA show that, if remediation is not conducted in the Basin, effects can be expected to continue for the foreseeable future. These demonstrated effects and the future risks predicted in the EcoRA, which are summarized below, were used as the basis for identifying remedial actions in the FS and this Plan. The impacts include:

- Migratory birds, mammals, fish, invertebrates, vegetation, including federally listed threatened and endangered species, are exposed to elevated levels of various metals due to mining activities in the Coeur d'Alene Basin.

- The AWQC for zinc and cadmium, as well as periodically for lead, are exceeded throughout the Coeur d'Alene River system downstream of mining impacts, in the Coeur d'Alene Lake, and in the Spokane River.

- Approximately 20 miles of the South Fork and 13 miles of tributaries are unable to sustain reproducing fish populations. Species density and diversity are reduced throughout the Basin, and the Ninemile and Canyon Creeks are essentially devoid of fish and other aquatic life in the area of mining impacts. Impacted species include the native bull trout, which is listed as "threatened" under the **Endangered Species Act** (ESA).

- Waterfowl deaths due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. 95 percent of available habitat in the Lower Basin has lead concentrations above the lowest observed adverse effects level (LOAEL) for waterfowl (530 mg/kg), and 80 percent has lead concentrations that are lethal to waterfowl (greater than 1,800 mg/kg).

- In the Coeur d'Alene River Basin, lead poisoning (primarily due to ingestion of contaminated sediments) is responsible for 96 percent of the total tundra swan mortality, compared to 20 to 30 percent (primarily due to ingestion of lead shot) at the Pacific flyway and national level.

- Members of 12 species of migratory birds and mammals have been killed through ingestion of lead-contaminated soils and sediments.

- Since 1986, a total of 27 species of wildlife have been documented with various degrees of lead exposure.

- The number of waterfowl carcasses found in 1997 represented the largest documented die-off in the Coeur d'Alene River Basin since 1953. This and other wildlife data collected over the past 20 years is supportive of the fact that lead concentrations in soil and sediment in the Coeur d'Alene Basin have not decreased. Therefore, animal deaths by lead poisoning from the ingestion of contaminated soils and sediment is expected to continue.

The EcoRA for the Basin evaluated risks to ecological receptors from metals in soil, sediment, and water. The ecological receptors included mammals, birds, fish and other aquatic organisms, amphibians, terrestrial plants, and soil invertebrates, as well as soil processes. In addition to the direct toxic effects of metals, the EcoRA also evaluated the effects of physical and biological ecosystem characteristics.

The EcoRA concluded that metals, principally cadmium, lead, and zinc, present significant risks to most ecological receptors throughout the Basin, including:

- Birds: 21 of 24 species evaluated
- Mammals: 12 of 18 species evaluated

- Amphibians: 3 of 4 species evaluated
- Plants: 6 of 6 species evaluated

The species evaluated are representative of hundreds of species that are similarly exposed.

Some of the highest risks were predicted for receptors in **riparian** and riverine habitats. The lead exposure of the spotted sandpiper was estimated to be 387 times greater than the LOAEL. The U.S. Fish and Wildlife Service (USFWS) intends to evaluate migratory birds that reside in riparian and riverine habitats in the Basin to better quantify the risks and to develop cleanup levels that would be protective of these birds.

Some species present, or potentially present, in the Basin are considered to be "special-status species," including those listed as endangered or threatened under the ESA, those listed by the USFWS as species of concern, state-listed sensitive plant species, and culturally significant plant species. Thirteen ESA special-status species were evaluated in the EcoRA. These include the following species identified by USFWS: two birds (bald eagle and black tern), five mammals (long-legged myotis, fisher, wolverine, gray wolf, and lynx), two fish (bull trout and westslope cutthroat trout), three amphibians (Idaho giant salamander, Coeur d'Alene salamander, and spotted frog), and one plant (Ute ladies'-tresses). The EcoRA determined that the aforementioned ESA species are at risk due to the metals, with the exception of the bald eagle, fisher, wolverine, gray wolf, and lynx. The National Marine Fisheries Service has indicated that it has no species of concern under the ESA in the Coeur d'Alene Basin since the Grand Coulee Dam blocks passage of **anadromous** fish in the Basin. Culturally significant plants evaluated include the water potato and wild rice.

5.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) provide a general description of what the cleanup is intended to accomplish. RAOs have been developed for the protection of human health and ecological receptors.

5.1 HUMAN HEALTH

The primary RAO for human health is to reduce or eliminate lead exposure pathways such that the probability of an individual child exceeding a blood lead level of 10 µg/dL is 5 percent or less and exceeding a blood lead level of 15 µg/dL is 1 percent or less. The RAOs for protection of human health are shown in Table 5-1.

Table 5-1
Remedial Action Objectives for Protection of Human Health in the Affected Areas of the Coeur d'Alene Basin

Environmental Media	Preliminary Remedial Action Objectives
Soils, Sediments and Source Materials	Prevent mechanical transportation of soil and sediments containing unacceptable levels of contaminants into residential areas and structures. Reduce or eliminate lead exposure pathways such that the probability of an individual child (aged 0 to 84 months) exceeding a blood lead level of 10 µg/dL is 5% or less and of exceeding a blood lead level of 15 µg/dL is 1% or less.[a] The exposure unit of a young child is centered in and around that child's individual residence as well as other areas in the community where routine exposures are occurring. Prevent direct human exposure to soils and sediments (ingestion, inhalation, and dermal contact) that: • Would exceed the cancer risk range of one in ten thousand to one in one million, ***or*** • Would have concentrations of contaminants of potential concern (e.g., lead and other metals) greater than selected risk-based levels for soil.
House Dust	Prevent the introduction of lead to residences from areas outside the home via tracking and air pathways such that the probability of an individual child (aged 0 to 84 months) exceeding a blood lead level of 10 µg/dL is 5% or less and of exceeding a blood lead level of 15 µg/dL is 1% or less.
Groundwater and Surface Water as Drinking Water	Prevent ingestion by humans of groundwater or surface water withdrawn or diverted from a private, unregulated source and used as drinking water and which contains contaminants of potential concern (e.g., cadmium and arsenic) for drinking water exceeding drinking water standards and risk-based levels for drinking water.
Aquatic Food Sources	Prevent ingestion by humans of aquatic organisms from surface waters containing contaminants of concern exceeding risk-based threshold concentrations.

Table 5-1 (Continued)
Remedial Action Objectives for Protection of
Human Health in the Affected Areas of the Coeur d'Alene Basin

Environmental Media	Preliminary Remedial Action Objectives
Vegetable Consumption	Prevent ingestion by humans of homegrown vegetables containing contaminants of concern exceeding risk-based threshold concentrations. Prevent use of residential garden soil that has concentrations of contaminants of potential concern (e.g., lead and other metals) greater than rural northern Idaho background levels.

[a] Development of these objectives was based on directives by the EPA Office of Solid Waste and Emergency Response (OSWER) (USEPA 1994, USEPA 1998) as presented in Appendix D of the FS Part 2 (USEPA 2001).

Notes:
µg/dL – microgram per deciliter

5.2 ECOLOGICAL

A number of RAOs were developed for ecological protection in Part 3 of the FS. Overall, these RAOs are designed to:

- Return the rivers and tributaries to conditions that will fully support healthy fish and other aquatic receptors, with an emphasis on native species, including sensitive native fish such as the bull trout (listed as "threatened" under the ESA)

- Return the wetland, lake, riparian, riverine, and upland areas to acceptable conditions for protection of waterfowl, migratory birds, and other species of plants and animals that live in these areas.

Numerical cleanup criteria for surface water will be set equal to the AWQC set forth in the Idaho Water Quality Standards and Wastewater Treatment Requirements, the Washington Water Quality Standards, or federal standards,[1] which have been established through the Clean Water Act to protect aquatic organisms.

Risk-based concentrations of metals in soil and sediment that are protective of ecological receptors were estimated in the EcoRA; however, numerical cleanup criteria have not yet been established. Numerical cleanup criteria for soil and sediment will be based on the land use, ecological characteristics of the area, and the plant and animal species that are present. For example, for sediment in the wetlands and lateral lakes of the Lower Basin, a lead level of

[1] The current Idaho and Washington AWQC for cadmium are not fully protective of the bull trout. EPA has recently established new AWQC for cadmium that are protective of bull trout. Numerical cleanup criteria for surface water will be equal to the new AWQC for cadmium.

530 mg/kg has been identified as the LOAEL for waterfowl. The USFWS anticipates conducting studies to support the development of soil and sediment cleanup criteria that are protective of migratory birds in riparian habitats. Cleanup criteria for floodplain sediment will also be based on the need to reduce contamination of groundwater that discharges to the river system. EPA anticipates that certain cleanup criteria (e.g., the AWQC) will be selected in the ROD and others will be selected during data collection and implementation of the interim action.

Protection of certain species is required by the **Migratory Bird Treaty Act** (MBTA) and the ESA. In order to comply with these ARARs, cleanup criteria will be protective of these species within the areas where they reside. Based on the EcoRA, 19 of 22 migratory bird species evaluated are at risk. These species are representative of hundreds of species that are similarly exposed.

EPA is proposing an interim action to address environmental risks in the Upper Basin and Lower Basin. This interim action will include establishing **interim benchmarks** (actions and criteria), which are near-term goals that will serve as landmarks and measurements to evaluate the progress of the remedy toward achievement of the long-term goals. The interim benchmarks identified for the interim action are discussed in Section 8.

6.0 SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives were developed as part of the FS for the site. The alternative development process began with identification of all potentially applicable cleanup methods. These methods were then evaluated based on how effective, implementable, and costly each would be if used as part of the Basin cleanup. The retained cleanup methods were then assembled into alternatives that cover a range of remedial options.

The remedial alternatives developed in the FS are not mutually exclusive choices and do not limit the choice of a remedy. The selected remedy may be a modification of the interim action or another remedy, based on new information or public comments. Consistent with the NCP, the remedial alternatives have been developed to a planning level of detail, not a design level of detail. All remedial actions would require a site-specific remedial design that may include additional data collection to further define the problem and refine the action.

Due to the very large size and complex nature of the Coeur d'Alene Basin, it was separated into four major components in the RI/FS. These components are:

- Human health risks in community and residential areas including soil, drinking water, house dust, and aquatic food sources
- Environmental risks in the Upper Basin and Lower Basin, including human health benefits for recreational and subsistence users
- Coeur d'Alene Lake
- Spokane River

A set of alternatives was developed for each of these components, as shown in Table 6-1. These alternatives are briefly described in this section. Detailed descriptions of the alternatives are presented in the FS Part 2 (Human Health Alternatives) and Part 3 (Ecological Alternatives, including the Upper Basin and Lower Basin, Coeur d'Alene Lake, and the Spokane River).

Each of the sets of alternatives includes the "no action" alternative. The no action alternative provides a baseline from which to compare the "action" alternatives. Its inclusion is meant to help assure that the consequences of no action are fully evaluated so that unnecessary remedial action is not taken where no action is appropriate.

The potential exists for recontamination of areas that would be remediated under the action alternatives. Recontamination would be addressed using engineering controls to the degree practical, or periodic maintenance where engineering controls are not sufficient to address the problem.

Table 6-1
Summary of Alternatives Developed for the Coeur d'Alene Basin

Focus	Media/Area	Alternative Designation	Description	Estimated Total Cost
Human Health Protection	Soil	S1	No Action	$0
		S2	Information and Intervention	$5,410,000
		S3	Information and Intervention and Access Modifications	$2,900,000
		S4[1]	Information and Intervention and Partial Removal and Barriers	$81,000,000
		S5[1]	Information and Intervention and Complete Removal	$123,000,000
	House Dust	D1	No Action	$0
		D2	Information and Intervention and Vacuum Loan Program/Dust Mats	$1,380,000
		D3	Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning	$4,290,000
	Drinking Water	W1	No Action	$0
		W2	Public Information	$428,000
		W3	Public Information and Residential Treatment	$1,418,000
		W4	Public Information and Alternative Source, Public Water Utility	$10,000,000
		W5	Public Information and Alternative Source, Groundwater	$2,900,000
		W6	Public Information and Multiple Alternative Sources	$2,210,000
	Aquatic Food Sources	F1	No Action	$0
		F2	Information and Intervention	$230,000
		F3	Information and Intervention and Monitoring	$910,000
Ecological Protection	Coeur d'Alene Basin (including Upper Basin and Lower Basin)	1	No Action	$0
		2	Contain/Stabilize with Limited Removal and Treatment	$370,000,000
		3	More Extensive Removal, Disposal, and Treatment	$1,300,000,000
		4	Maximum Removal, Disposal, and Treatment	$2,600,000,000
		5	State of Idaho Cleanup Plan	$257,000,000
		6	Mining Companies Cleanup Plan	$194,000,000
	Coeur d'Alene Lake	1	No Action (includes monitoring)	$1,300,000
		2	Institutional Controls	$8,800,000
	Spokane River	1	No Action	$0
		2	Institutional Controls	$900,000
		3	Containment with Limited Removal and Disposal	$1,800,000
		4	More Extensive Removal, Disposal, and Treatment	$6,500,000
		5	Maximum Removal and Disposal	$28,000,000

[1]Based on removal, capping, and revegetation of soil with >1,000 parts per million (ppm) lead in community areas (yards, rights-of-way, etc.) and >700 ppm lead in common use areas in towns. Community areas between 700 and 1,000 ppm lead would receive a vegetative barrier.

6.1 HUMAN HEALTH IN COMMUNITY AND RESIDENTIAL AREAS

Human health alternatives were developed for the primary potential exposure media:

- Soil
- House dust
- Drinking water
- Aquatic food sources

Risk from eating homegrown vegetables is addressed by the soil alternatives. The ultimate effectiveness of the aquatic food sources alternatives would be highly dependent on the reductions of metals uptake by fish achieved through implementation of ecological remedies.

Soil Alternatives

Soil Alternative S1—No Action. This alternative would leave contaminated soil in place with no change in existing conditions.

Soil Alternative S2—Information and Intervention. This alternative would include deed notices, pamphlet distribution, press releases, public meetings, publicly posted notices, and advisory signs in public areas to both inform the public of risk mitigation and new risk information and solicit public input and involvement. This alternative would also include a program similar to the Panhandle Health District's Lead Health Intervention Services, which provides personal health and hygiene information to help mitigate exposure to contaminants through soil ingestion.

Soil Alternative S3—Information and Intervention and Access Modifications. In addition to information and intervention, this alternative would include constructing fences or other barriers around certain areas and providing maintenance to prevent or limit access to certain areas where risk level and persistency warrant. This alternative is not intended for use on residential properties.

Soil Alternative S4—Information and Intervention and Partial Removal and Barriers. In addition to information and intervention, this alternative would include removing a limited amount of contaminated soil and placing clean barriers. Contaminated yards would be excavated to a typical depth of about 1 foot. Garden areas would be provided with a minimum of 2 feet of clean fill. In order to mitigate potential exposure pathways, the excavated areas would be backfilled with clean soils and/or capped. In addition to residential yards, common use areas such as streets, alleys, rights-of-way, and playgrounds would also be candidates for remediation if soil contamination warrants. For recreational areas, this alternative would include site improvements to reduce exposure risks. These would be specific to individual recreational areas and, in addition to partial soil removal and access restrictions, could include stabilizing river

banks, constructing paved boat ramps and parking areas, excavating or capping day-use and overnight camping areas, signage, and providing picnic tables.

Soil Alternative S5—Information and Intervention and Complete Removal. In addition to information and intervention, this alternative would attempt to completely remove from properties soil that exceeds action levels and dispose of it. The depth of contaminated soil is expected to vary considerably within the Basin, but complete removal is considered to be excavation of residential yard and garden areas to a depth of 4 feet. This alternative is not envisioned for recreational areas.

House Dust Alternatives

House Dust Alternative D1—No Action. The No Action alternative would leave contaminated house dust in place and would not change existing conditions.

House Dust Alternative D2—Information and Intervention and Vacuum Loan Program/Dust Mats. This alternative has three major components. First, information and intervention for house dust would include pamphlet distribution, press releases, public meetings, and publicly-posted notices to inform the public of remedial actions and to provide exposure education. In addition, public input and involvement would be sought. This program has been administered as part of the Public Health District's (PHDs) Lead Health Intervention Program at the Bunker Hill Box for approximately 15 years and throughout the Basin since 1996. The second component of this alternative would be expansion of the Vacuum Loan Program initiated at Bunker Hill, which allows residents to use a heavy-duty vacuum cleaner equipped with high efficiency particulate air (HEPA) filters. The third component would be free dust mats for entryways, which would be provided to residents to reduce tracking exterior dust into the home.

House Dust Alternative D3—Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning. In addition to the components of Alternative D2, this alternative would include interior cleaning and removing and replacing some household items that are either difficult to clean effectively or that provide a source for recontamination. These activities would occur only after exterior sources of contamination had been permanently remediated to ensure cost-effectiveness and prevent recontamination.

Drinking Water Alternatives

Drinking Water Alternative W1—No Action. This alternative would leave contaminated drinking water sources in place with no changes in existing use.

Drinking Water Alternative W2—Public Information. This alternative would include pamphlet distribution, press releases, public meetings, and publicly posted notices to inform the public of risk mitigation and new risk information and solicit public input and involvement.

Drinking Water Alternative W3—Public Information and Residential Treatment. In addition to public information, this alternative would include wellhead filtration (if applicable) and point-of-use filtration.

Drinking Water Alternative W4—Public Information and Alternative Source, Public Water Utility. In addition to public information, this alternative would include permitting and constructing drinking water conveyances from public water utilities to residences or common-use areas.

Drinking Water Alternative W5—Public Information and Alternative Source, Groundwater. For properties currently supplied water by contaminated wells or other unregulated sources, this alternative would include (in addition to public information) permitting and constructing new wells into a suitable alternative aquifer, installing necessary appurtenances, and abandoning existing contaminated wells.

Drinking Water Alternative W6—Public Information and Multiple Alternative Sources. This alternative would include public information, in addition to one of the above-described alternatives, depending on geographic issues. For areas inside water districts, the alternative would provide to individual residences or common areas a hookup to the existing public water system. For areas outside water districts (mostly in the tributary gulches), it is assumed that public water utilities would not be able to provide an alternative water source because of the annexation and engineering issues of constructing distribution systems; therefore, the assumed alternative for these areas would be to provide either point-of-use treatment or new groundwater wells.

Aquatic Food Sources Alternatives

Aquatic Food Sources Alternative F1—No Action. This alternative would take no action to address the potential human health risk to residents and Tribal members of eating contaminated fish.

Aquatic Food Sources Alternative F2—Information and Intervention. In addition to the information and intervention efforts of other alternatives, this alternative would educate fishermen and other recreational users about the potential health risk of consuming contaminated fish caught in waterways and wetlands.

Aquatic Food Sources Alternative F3—Information and Intervention and Monitoring. This alternative would build on the efforts of informing and educating fishermen of risks resulting from consumption of metals-contaminated fish included under Alternative F2. An effort to gain more fish metals load data from each of the lateral lakes, the South Fork, lower Coeur d'Alene River, and Coeur d'Alene Lake is the keystone of this alternative. The current limited fish flesh data from three lateral lakes would be expanded so that lake-specific recommendations and intervention can be accurately provided to the public. Surface waters and

fish species that are totally free of metals risks would be identified and highlighted. As Basin cleanup and mitigation efforts proceed, periodic resampling would provide valuable effectiveness monitoring data for biological response to cleaner waters, sediment, and upstream soils. A seasonal program of trained "river rangers" would be instituted to make daily contacts with fishermen and boaters to inform and educate them of metals hazards and prevention methods. Fishermen can be directed to lakes or rivers where fish metals risks are known to be the lowest.

6.2 ECOLOGICAL ALTERNATIVES FOR THE UPPER BASIN AND LOWER BASIN

To adequately evaluate the basinwide effects of potential remedial actions, ecological alternatives were developed for the combined Upper Basin and Lower Basin. Six ecological alternatives were developed.

- Alternative 1—No Action
- Alternative 2—Contain/Stabilize with Limited Removal and Treatment
- Alternative 3—More Extensive Removal, Disposal, and Treatment
- Alternative 4—Maximum Removal, Disposal, and Treatment
- Alternative 5—State of Idaho Cleanup Plan
- Alternative 6—Mining Companies Cleanup Plan

Each of these alternatives includes an extended period of natural recovery.

Ecological Alternative 1–No Action. Alternative 1 would include no actions to control exposures of ecological receptors to contaminants. Risks to fish and other aquatic receptors, birds, and terrestrial receptors would continue to exist for the foreseeable future.

Ecological Alternative 2–Contain/Stabilize with Limited Removal and Treatment. Actions are generally aimed at controlling sources having the highest metal loadings to groundwater and surface water and the highest levels of ecological exposure. Limited removals and in-place and on-site waste containment would be used to control ecological and human exposures, as well as metal loading to the river system. **Bioengineering** would be used to provide bank and stream stabilization, control erosion of contaminated sediments, and support natural recovery of riverine and riparian habitat. Water treatment would be limited to **passive treatment** of drainage from the adits that are the major metals loaders and of groundwater collected as part of **hydraulic isolation** (limited to the Hecla-Star tailings pounds in Canyon Creek and the Cataldo/Mission Flats dredge spoil area). Limited actions in lateral lakes and wetlands would be conducted to provide additional safe waterfowl feeding areas.

Ecological Alternative 3–More Extensive Removal, Disposal, and Treatment. Alternative 3 would extend the cleanup level of Alternative 2 to include more extensive and effective removal, containment, and treatment, including:

- More extensive use of hydraulic isolation to prevent the discharge of contaminated groundwater to the river system, groundwater treatment to address deeper and inaccessible floodplain sediments, as well as additional tailings impoundments in the Upper Basin
- A regional **active water treatment** plant to treat drainage from adits and groundwater containing large loads of metals
- Extensive excavation of river banks and bed sediment and more extensive actions in lateral lakes and wetlands in the Lower Basin
- Interim surface water treatment in Canyon Creek and, if necessary, in Ninemile Creek

Because of the large amount of material that would be excavated, materials would need to be consolidated in regional repositories in the Upper Basin and Lower Basin. In some wetlands and lateral lakes, contaminated material would be consolidated in place within a smaller footprint. Wetlands and lateral lakes used for consolidation would maintain full functionality.

Ecological Alternative 4–Maximum Removal, Disposal, and Treatment. Alternative 4 would include removal of sources to the maximum practical extent with regional consolidation in repositories. It would extend the use of active water treatment, and deeper and inaccessible floodplain sediments not removed would be contained using hydraulic isolation. Residual risks resulting from contaminated materials left in place or only partially contained would be minimized to the maximum extent practical.

Ecological Alternative 5–State of Idaho Plan. Alternative 5, developed by IDEQ, would focus on containing or stabilizing the largest sources of metals loading to surface water. Alternative 5 includes measures similar to Alternatives 2 and 3; it includes regional consolidation of materials in repositories and passive water treatment, but does not include an active water treatment plant.

Ecological Alternative 6–Mining Companies Plan. Alternative 6 consists of prioritized actions primarily focused on regrading or removing source material from water courses to reduce erosion and the potential for contact with surface and groundwater that could result in leaching and surface water loading. Local areas of bioengineered and vegetative stream bank stabilization are included. Regional consolidation of materials in repositories and active water treatment plants are not included.

6.3 COEUR D'ALENE LAKE

Two alternatives have been developed for Coeur d'Alene Lake.

- Alternative 1—No Action
- Alternative 2—Implementation of the Lake Management Plan

Coeur d'Alene Lake Alternative 1—No Action. Alternative 1 would include no additional actions to manage nutrients inputs to the lake. Nutrients, including nitrogen and phosphorus, affect water quality in the lake, which may in turn affect the rate of release of metals from the lake bottom into the lake water. Alternative 1 would include monitoring of the lake.

Coeur d'Alene Lake Alternative 2—Implementation of the Lake Management Plan. Alternative 2 consists of implementation of the Lake Management Plan. The plan was initially developed in 1996 by the Clean Lakes Coordinating Council, Coeur d'Alene Tribe, IDEQ, and local governments. The plan contains measures to control nutrient inputs to the lake; high nutrient levels in the lake could lead to an increased rate of release of metals from contaminated sediments at the bottom of the lake. The measures include implementation of best management practices for forestry, stormwater, roads, and agriculture in watersheds that drain to the lake, reduction of boat wake erosion of river banks through establishment of "no wake" zones, and improvements in septic and municipal wastewater treatment systems.

6.4 SPOKANE RIVER

In consultation with the State of Washington, five alternatives have been developed for the Spokane River between the state line and Upriver Dam.

- Alternative 1—No Action
- Alternative 2—Institutional Controls
- Alternative 3—Containment with Limited Removal and Disposal
- Alternative 4—More Extensive Removal, Disposal, and Treatment
- Alternative 5—Maximum Removal and Disposal

The mining companies did not develop a cleanup plan for the Spokane River.

Spokane River Alternative 1—No Action. Alternative 1 would include no actions to control exposures of humans or ecological receptors to contaminants. Risks to humans associated with recreation at impacted sediment areas, including consumption of fish caught in the Spokane River, and to waterfowl would continue to exist for the foreseeable future.

Spokane River Alternative 2—Institutional Controls. Institutional controls would include the maintenance of the existing health postings and advisories at beaches and restriction of vehicular access at certain key locations. Although pedestrian access to the sites would not be restricted, the postings and advisories may encourage some individuals to reduce their exposure to the contaminated deposits. Restricting vehicular access would help reduce erosion of the contaminated deposits and allow vegetation to naturally re-establish.

Spokane River Alternative 3—Containment with Limited Removal and Disposal. Alternative 3 includes actions focused on addressing potential human health risks. Containment actions, supplemented by removals where necessary, would be used to reduce or eliminate the direct contact and ingestion human health exposure pathways. Beach material posing potential human health risks would generally be left in place and covered with a clean layer of imported beach material. In locations where habitat may be adversely affected by the grade changes created by a cover, other actions such as excavation and disposal or excavation and on-site consolidation, would be used. In these areas, the excavated areas would be backfilled with suitable material to restore desired grades and elevations. In-stream sediments would receive no action under Alternative 3.

Spokane River Alternative 4—More Extensive Removal, Disposal, and Containment. Alternative 4 includes actions to address potential human health risks and ecological risks. Actions for beach and bank deposits would include all areas addressed under Alternative 3 as well as critical feeding areas that may pose significant ecological risks. The affected beach and bank materials would be excavated and disposed of off-site. All excavated areas would be backfilled with suitable material to restore desired grades and elevations. In-stream sediments (behind Upriver Dam) exceeding cleanup levels would be capped to minimize direct ecological exposures.

Spokane River Alternative 5—Maximum Removal and Disposal. Alternative 5 includes more extensive beach and in-stream sediment cleanup actions to remove, where practical, all materials posing significant human health or ecological risks. The affected beach and bank materials would be excavated and disposed of off-site. All excavated areas would be backfilled with suitable material to restore desired grades and elevations. In-stream sediments behind Upriver Dam that exceed cleanup levels would be dredged and disposed of off site.

7.0 EVALUATION OF ALTERNATIVES AND DEVELOPMENT OF THE INTERIM ACTION

EPA uses nine criteria to evaluate the remedial alternatives individually and against each other in order to select a remedy. These criteria are shown in Table 7-1. The evaluation is conducted to identify the key tradeoffs between the alternatives.

Table 7-1
Evaluation Criteria for Superfund Remedial Alternatives

Criterion		Description
Threshold criteria	Overall protection of human health and the environment	Determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
	Compliance with ARARs	Evaluates whether the alternative meets Federal, State, and Tribal environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
Balancing criteria	Long-term effectiveness and permanence	Considers the ability of an alternative to maintain protection of human health and the environment over time.
	Reduction of toxicity, mobility, or volume through treatment	Evaluates an alternative's use of treatment to reduce a) the harmful effects of principal contaminants, b) their ability to move in the environment, and c) the amount of contamination remaining after remedy implementation.
	Short-term effectiveness	Considers the length of time needed to implement an alternative and the risk the alternative poses to workers, residents, and the environment during implementation.
	Implementability	Considers the technical and administrative feasibility of implementing the alternative, including factors such as the availability of materials and services.
	Cost	Includes estimated present worth capital and operations and maintenance (O&M) costs. O&M costs are estimated for a 30-year period using a discount rate of 7%.
Modifying criteria	State/tribal acceptance	Considers whether the States and Tribes agree with the EPA's analyses and recommendations, as described in the RI/FS and the Proposed Plan.
	Community acceptance	Considers whether the local community agrees with the EPA's analyses and the interim action. Comments received on the Proposed Plan during the public comment period are an important indicator of community acceptance.

Summaries of the alternatives evaluations are presented in Tables 7-2 through 7-5 (human health in community and residential areas), Table 7-6 (environmental protection in the Upper Basin and Lower Basin), Table 7-7 (Coeur d'Alene Lake), and Table 7-8 (Spokane River). In these tables, each of the alternatives is given a rating (lowest, low, medium, or highest) for each evaluation criterion. The tables also provide the basis for each rating.

7.1 HUMAN HEALTH IN COMMUNITY AND RESIDENTIAL AREAS

Based on the comparative analysis, EPA believes the best balance of tradeoffs is represented by Alternative S4 for soil, Alternative D3 for house dust, Alternative W6 for drinking water, and Alternative F3 for aquatic food sources.

For soil, Alternatives S4 and S5 are the only alternatives believed likely to meet the RAOs for blood lead levels. Consequently, Alternatives S1, S2, and S3 are not considered adequately protective. The increased implementability, fewer short-term impacts to the community, and lower cost of the partial removals under Alternative S4 outweigh the somewhat greater reduction of residual risk resulting from complete removals under Alternative S5.

For house dust, both Alternatives D2 and D3 are expected to achieve the RAOs for blood lead levels at most homes where residents participate in the programs. Alternative D1 is not considered protective for risks from house dust. Alternative D3 provides for additional cleaning at some homes where exterior soil remediation, dust mats, and vacuum loan programs do not provide sufficient reductions in exposure to contaminated house dust. The greater reduction in residual risk and greater long-term reliability of extensive cleaning under Alternative D3 outweigh the lower cost of the vacuum loan and dust mat programs under Alternative D2.

For drinking water, Alternatives W3, W4, W5, and W6 are all potentially protective and ARAR-compliant. Alternatives W1 and W2 are not expected to be protective or ARAR-compliant where MCLs are exceeded. Alternative W6 provides the best balance of tradeoffs because the most appropriate technology at each site would be used. Protectiveness and compliance with ARARs could be achieved at all sites, including those where no suitable alternative aquifer exists and connection to a public water source would not be feasible. Where a suitable alternative aquifer does exist or connection to a public water source is feasible, these actions would be taken and would be expected to have greater long-term reliability than point-of-use treatment (Alternative W3).

For aquatic food sources, Alternative F3 is expected to more effectively limit exposures to metals than Alternatives F1 or F2. The use of monitoring is expected to more reliably identify areas of potential exposures and be more likely to result in reduced consumption of aquatic food sources in areas of exposure.

The details of the evaluation can be found in Section 6 of Part 2 of the FS.

Table 7-2
Comparison of Soil Alternatives for Protection of Human Health in Residential and Community Areas

Criterion	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Overall Protection of Human Health and the Environment	**Lowest** Would not be protective.	**Low** Limited reduction in exposure from behavior modification, would not achieve full protection. Not preventative- intervention would occur only after child exhibits elevated blood lead.	**Low** Access would be limited at recreation areas, but exposures at the home would be the same as Alternative S2.	**Highest** Removal and replacement of top layer of contaminated soil with clean cap would result in a large increase in protectiveness relative to Alternative S3. Addresses exposures at recreational areas.	**Highest** Most protective for yards and community areas where all contaminated soil would be removed; however, does not address exposures at recreational areas.
Compliance with ARARs	**Lowest** No ARARs apply to Alternative S1. Unlikely to achieve EPA and CDC national guidelines for blood lead levels.	**Lowest** No ARARs apply to Alternative S2. Unlikely to achieve EPA and CDC national guidelines for blood lead levels.	**Lowest** No ARARs apply to Alternative3. Unlikely to achieve EPA and CDC national guidelines for blood lead levels.	**Highest** Could be implemented in compliance with action and location-specific ARARs. Expected to achieve EPA and CDC national guidelines for blood lead levels.	**Medium** Could be implemented in compliance with action and location-specific ARARs. Expected to achieve EPA and CDC national guidelines for blood lead levels, with possible exception of frequent recreational users.
Long-Term Effectiveness and Permanence	**Not evaluated** Alternative does not meet the threshold criteria.	**Low** Residual risks would be associated with contaminated soil left in place. Long-term reliability of institutional controls would rely on voluntary compliance and participation.	**Low** Residual risks would be associated with contaminated soil left in place. Long-term reliability of institutional controls would rely on voluntary compliance and participation.	**Medium** Large reduction in residual risk and reliability of controls relative to Alternative S3 because contaminated soil would be removed. Some residual risk from potential exposure to deeper contaminated soils not removed.	**Medium** Complete soil removal would result in least residual risk and greatest reliability for yards and community areas. Residual risks would remain in recreational areas.
Reduction of Toxicity, Mobility, or Volume through Treatment		None of the alternatives include treatment			
Short-Term Effectiveness Short-term impacts to community and environment - Time to achieve RAOs		**Low** Few impacts to community and environment; however, unlikely to achieve RAOs for blood lead levels.	**Low** Relatively few impacts to community and the environment; however, unlikely to achieve RAOs for blood lead levels because yard soils are not addressed.	**Highest** Expected to achieve RAOs for blood lead levels within a short time after the completion of remedial actions in all areas. Some impacts to community from traffic and dust generation.	**Medium** Expected to achieve RAOs for blood lead levels within a short time after the completion of remedial actions in all areas except recreational areas. Most impacts to community from increased truck traffic and dust generation.
Implementability		**Highest** Few implementability considerations.	**Highest** Relatively few implementability considerations.	**Medium** Availability of topsoil for capping of yards may be limited. Some limitations may be encountered siting repositories for contaminated soil.	**Lowest** Availability of topsoil for capping of yards may be limited. Most limitations for siting repositories for contaminated soil. Complete removal more difficult than partial removal.
Cost		Total estimated cost = $5,410,000 Estimated present worth O&M cost = $1,900,000	Total estimated cost = $2,900,000 Estimated present worth O&M cost = $670,000	Total estimated cost = $81,000,000 Estimated present worth O&M cost = $2,550,000	Total estimated cost = $123,000,000 Estimated present worth O&M cost = $2,400,000
State/Tribal Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan				
Community Acceptance	To be completed following receipt of public comments on Proposed Plan				

Table 7-3
Comparison of House Dust Alternatives for Protection of Human Health in Residential and Community Areas

Criterion	Alternative D1 No Action	Alternative D2 Information & Intervention and Vacuum Loan Program/Dust Mats	Alternative D3 Extensive Cleaning
Overall Protection of Human Health and the Environment	**Lowest** Would not be protective	**Medium** Likely to be protective where contamination moderately exceeds action levels and residents participate in program.	**Highest** Most protective alternative.
Compliance with ARARs	**Lowest** Unlikely to achieve EPA and CDC national guidelines for blood lead levels.	**Highest** Could be implemented in compliance with ambient air quality regulations. Expected to achieve EPA and CDC national guidelines for blood lead levels where residents participate in program.	**Highest** Could be implemented in compliance with ambient air quality regulations. Expected to achieve EPA and CDC national guidelines for blood lead levels.
Long-Term Effectiveness and Permanence	**Not evaluated** Alternative does not meet the threshold criteria	**Medium** Would be less effective at reducing residual risks than extensive cleaning. Long-term reliability of vacuum loan program would depend on participation of residents.	**Highest** Greatest reduction of residual risk. Long-term reliability would depend on participation of residents.
Reduction of Toxicity, Mobility, or Volume through Treatment		None of the alternatives include treatment	
Short-Term Effectiveness Short-term impacts to community and environment - Time to achieve RAOs		**Low** Short-term impacts to residents and workers could be limited using health and safety precautions. Relatively short-implementation period, but some time required to meet RAOs for blood lead levels.	**Medium** Short-term impacts to residents and workers could be limited using health and safety precautions. Expected to meet RAOs for blood lead levels sooner than Alternative D2.
Implementability		**Highest** Administrative and technical feasibility has been demonstrated in Basin.	**Medium** No significant administrative or technical feasibility difficulties anticipated.
Cost		Total estimated cost = $1,380,000 Estimated present worth O&M cost = $1,000,000	Total estimated cost = $4,290,000 Estimated present worth O&M cost = $1,000,000
State/Tribal Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan		
Community Acceptance	To be completed following receipt of public comments on Proposed Plan		

Table 7-4
Comparison of Drinking Water Alternatives for Protection of Human Health in Residential and Community Areas

Criterion	Alternative W1 No Action	Alternative W2 Public Information	Alternative W3 Public Information and Residential Treatment	Alternative W4 Public Information and Alternative Source, Public Water Utility	Alternative W5 Public Information and Alternative Source, Groundwater	Alternative W6 Public Information and Multiple Alternative Sources
Overall Protection of Human Health and the Environment	**Lowest** Would not be protective where MCLs are exceeded.	**Low** Least protective of action-oriented alternatives.	**Medium** Potentially protective, but long-term effectiveness would be limited by reliability and maintenance of treatment units.	**Highest** A reliable source of clean water would be provided at most locations where MCLs are exceeded. Implementability would be a limitation at locations far from a public water source.	**Highest** A source of clean water would be provided at most locations where MCLs are exceeded. Implementability would be a limitation in some areas where no suitable alternative aquifer exists.	**Highest** Clean water would be provided at all locations where MCLs are exceeded. Most appropriate technology would be selected for each site.
Compliance with ARARs	**Lowest** Would not comply with ARARs where MCLs are exceeded.	**Lowest** Would not comply with ARARs where MCLs are exceeded.	**Medium** Would usually comply with ARARs at locations where maintenance of treatment units is conducted.	**Highest** Would comply with ARARs in all areas where connection to a public water source is feasible.	**Highest** Would comply with ARARs in all areas where a suitable alternative aquifer is present.	**Highest** Would comply with ARARs at almost all locations.
Long-Term Effectiveness and Permanence	**Not evaluated** Alternative does not meet the threshold criteria	**Low** Includes no actions to permanently reduce residual risks where MCLs are exceeded. Long-term reliability of institutional controls would be limited.	**Medium** Long-term effectiveness would be limited by reliability and maintenance of treatment units.	**Highest** Would be very effective and reliable all areas where connection to a public water source is feasible.	**Medium** Long-term reliability of groundwater wells may be less than public water supply.	**Highest** Most appropriate technology would be selected for each site.
Reduction of Toxicity, Mobility, or Volume through Treatment		No treatment included	**Highest** Most reduction of toxicity using point-of-use treatment units	No treatment included	No treatment included	**Medium** Reduction of toxicity would occur at locations where point-of-use treatment units are used.
Short-Term Effectiveness Short-term impacts to community and environment - Time to achieve RAOs		**Low** Unlikely to achieve RAOs for drinking water	**Highest** Relatively short period to implement, which would be followed almost immediately by achievement of drinking water RAOs.	**Medium** Relatively long period to implement in areas outside of water district, which would be followed almost immediately by achievement of drinking water RAOs.	**Medium** Relatively long period to implement completely, which would be followed almost immediately by achievement of drinking water RAOs.	**Highest** Relatively short period to implement, which would be followed almost immediately by achievement of drinking water RAOs.
Implementability		**Highest** Few implementability considerations.	**Highest** Relatively few implementability considerations.	**Medium** Potential administrative considerations and limitations on capacity in areas within water districts. Numerous administrative and technical considerations related to designing and constructing water systems outside of water districts.	**Low** Implementability would be very limited in areas where no suitable aquifer exists. Moratoriums on construction of new wells exist in some areas.	**Highest** Most implementable technology could be selected.
Cost		Total estimated cost = $428,000 Estimated present worth O&M cost = $428,000	Total estimated cost = $1,418,000 Estimated present worth O&M cost = $960,000	Total estimated cost = $10,000,000 Estimated present worth O&M cost = $520,000	Total estimated cost = $2,900,000 Estimated present worth O&M cost = $590,000	Total estimated cost = $2,210,000 Estimated present worth O&M cost = $535,000
State/Tribal Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan					
Community Acceptance	To be completed following receipt of public comments on Proposed Plan					

Table 7-5
Comparison of Aquatic Food Sources Alternatives for Protection of Human Health

Criterion	Alternative F1 No Action	Alternative F2 Information and Intervention	Alternative F3 Information and Intervention and Monitoring
Overall Protection of Human Health and the Environment	**Lowest** No reduction in potential exposure and not protective	**Medium** Anticipated to produce some reduction of exposure. Long-term protectiveness would primarily depend on reductions of metals in environmental media.	**Highest** Monitoring would be expected to result in a greater reduction of exposure than Alternative F2. Long-term protectiveness would primarily depend on reductions of metals in environmental media.
Compliance with ARARs	No ARARs specifically address consumption of aquatic food sources.		
Long-Term Effectiveness and Permanence	**Not evaluated** Alternative does not meet the threshold criteria	**Medium** Long-term effectiveness primarily depends on reductions of metals in environmental media. Program anticipated to last for 30 years.	**Medium** Long-term effectiveness primarily depends on reductions of metals in environmental media. Program anticipated to last for 30 years.
Reduction of Toxicity, Mobility, or Volume through Treatment		None of the alternatives include treatment	
Short-Term Effectiveness Short-term impacts to community and environment - Time to achieve RAOs		**Medium** Remedy could be implemented rapidly; however, reduction of fish consumption anticipated to be limited. Minimal impacts to community or environment.	**Highest** Remedy could be implemented rapidly; monitoring is anticipated to result in greater reduction of fish consumption in areas of exposure. Minimal impacts to community or environment.
Implementability		**Highest** Could be readily implemented.	**Highest** Could be readily implemented.
Cost		Total estimated cost = $230,000 Estimated present worth O&M cost = $230,000	Total estimated cost = $910,000 Estimated present worth O&M cost = $910,000
State/Tribal Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan		
Community Acceptance	To be completed following receipt of public comments on FS and Proposed Plan		

Table 7-6
Comparison of Ecological Alternatives for the Upper Basin and Lower Basin Using CERCLA Criteria

Criterion	Alternative 1 No Action	Alternative 2 Contain/Stabilize with Limited Removal and Treatment	Alternative 3 More Extensive Removal, Disposal and Treatment	Alternative 4 Maximum Removal, Disposal and Treatment	Alternative 5 State of Idaho Cleanup Plan	Alternative 6 Mining Companies Cleanup Plan
Overall Protection of Human Health and the Environment	**Lowest** Not protective	**Medium** Intermediate level of long-term effectiveness and time to achieve RAOs, including ARARs. Potential short-term impacts and implementability problems.	**Highest** Slightly lower long-term effectiveness and slightly longer time to achieve RAOs, including ARARs, compared to Alternative 4 outweighed by lesser short-term impacts and greater implementability.	**Highest** Slightly greater long-term effectiveness and slightly shorter time to achieve RAOs, including ARARs, compared to Alternative 3 outweighed by greater short-term impacts and reduced implementability.	**Low** More protective than Alternative 6, particularly in the Lower Basin, but less protective than Alternative 2. Lower protectiveness relative to Alternative 2 balanced by fewer short-term impacts and implementability concerns.	**Low** Least protective of action alternatives.
Compliance with ARARs	**Lowest** Would not comply with ARARs within a reasonable timeframe	**Medium** Intermediate time to achieve ARARs compliance. Estimated time to achieve compliance 150% longer than Alternative 4.	**Highest** Second shortest time to achieve ARARs compliance. Estimated time to achieve compliance 30% longer than Alternative 4.	**Highest** Shortest time to achieve ARARs compliance.	**Low** Second longest time to achieve ARARs compliance. Estimated time to achieve compliance 170% longer than Alternative 4.	**Low** Longest time to achieve ARARs compliance among action alternatives. Estimated time to achieve compliance 180% longer than Alternative 4.
Long-Term Effectiveness and Permanence	**Not evaluated** Alternative does not meet the threshold criteria	**Low** Residual risk includes moderate potential for future erosion of impacted bed and bank sediments in Lower Basin and loading from sediments in Upper Basin. Most wetlands unremediated. Estimated reduction of dissolved metals load of 26% at completion of remedy implementation. Passive water treatment used, which may be less reliable than active treatment. Effectiveness of soil treatment in Lower Basin is uncertain.	**Medium** Substantially greater long-term effectiveness than Alternatives 2 and 5, due to more extensive actions to control metals loads from sediments and river beds. Estimated reduction of dissolved metals load of 57% at completion of remedy implementation. Hydraulic isolation used to limit loading from inaccessible sediments in Upper Basin, which may be less reliable than removals. Residual risk includes unremediated wetlands. Active water treatment used, which may be more reliable than passive treatment.	**Highest** Fewest residual risks. Greatest long-term effectiveness and permanence as a result of most widespread use of removal and disposal. Estimated reduction of dissolved metals load of 64% at completion of remedy implementation. Most extension remediation of wetlands.	**Low** Residual risks result from limited actions to address sediments and associated dissolved metals loads in Upper Basin. Generally similar level of long-term effectiveness in Lower Basin as Alternative 2. Estimated reduction of dissolved metals load of 12% at completion of remedy implementation. Passive water treatment used, which may be less reliable than active treatment. Effectiveness of soil treatment in Lower Basin is uncertain.	**Lowest** Highest residual risks among action alternatives, resulting from fewest actions to address sediments in Upper Basin and contaminated banks, beds, and wetlands in Lower Basin. Estimated reduction of dissolved metals load of 9% at completion of remedy implementation. Relies primarily on institutional controls to reduce waterfowl exposure to metals. Uses passive water treatment, which may be less reliable than active treatment.
Reduction of Toxicity, Mobility, or Volume through Treatment		**Medium** Drainage from major adits using passive treatment; no groundwater treatment. Total reduction through treatment similar to Alternative 5.	**Highest** Maximum reduction of water toxicity through treatment of adit drainage, groundwater, and surface water.	**Highest** Maximum reduction of water toxicity through treatment of adit drainage and groundwater.	**Medium** Drainage from major adits using passive treatment; no groundwater treatment. Total reduction through treatment similar to Alternative 2.	**Low** Wetlands treatment of drainage from four adits. Least reduction of toxicity through treatment of action alternatives.
Short-Term Effectiveness - Short-term impacts to community and environment - Time to achieve RAOS		**Medium** Intermediate level of potential short-term water quality impacts. Moderate potential for short-term habitat loss. Greater potential risks to community from increased truck traffic and dust generated by remedial activities than Alternatives 5 and 6. **Low** Longer implementation period than Alternative 5, but shorter period of natural recovery would be needed to achieve surface water RAOs.	**Low** Substantial potential for short-term water quality impacts, especially from riverbed dredging, and for short-term loss of habitat. Second greatest potential risks to community from increased truck traffic and dust generated by remedial activities among alternatives. **Medium** Relatively long implementation period, but soil/sediment RAOs would be achieved at most locations, and a relatively short period of natural recovery would be needed to achieve surface water RAOs.	**Lowest** Greatest potential for short-term water quality impacts and short-term loss of habitat . Greatest potential risks to community from increased truck traffic and dust generated by remedial activities among alternatives. **Medium** Longest implementation period, but soil/sediment RAOs would be achieved at the largest number of locations, and the shortest period of natural recovery would be needed to achieve surface water RAOs.	**Medium** Relatively little potential for short-term water quality impacts. Moderate potential for short-term habitat loss. Relatively few risks to the community from remedy implementation. **Low** Relatively short implementation period, but soil/sediment RAOs would be achieved at a limited number of locations, and a long natural recovery period would be needed to achieve surface water RAOs.	**Highest** Relatively little potential for short-term water quality impacts or habitat loss. Relatively small risks to the community from remedy implementation. **Lowest** Relatively short implementation period, but soil/sediment RAOs would be achieved at relatively few locations, and the longest natural recovery period would be needed to achieve surface water RAOs.
Implementability		**Medium** Potential concerns with availability of topsoil (or other growth media) and clean fill needed for revegetation of removal areas and repositories. Siting of repositories with 2.5 million cy capacity may be feasible. Potential problems with feasibility of sediment removals.	**Low** Limited availability of topsoil (or other growth media) and clean fill needed for revegetation of removal areas and repositories. Substantial siting problems associated with 26 million cy of repository capacity. Potential problems with feasibility of sediment removals and hydraulic isolation.	**Lowest** Greatest implementability problems related to availability of materials, technical feasibility, and siting of repositories with 67 million cy of capacity.	**Highest** Relatively small materials requirements. Siting of repositories with 1.4 million cy capacity should be feasible.	**Highest** Least materials requirements. Siting of repositories with 260,000 cy capacity should be feasible.
Cost		Total estimated present worth cost = $370,000,000 Estimated present worth O&M cost = $44,000,000	Total estimated present worth cost = $1,300,000,000 Estimated present worth O&M cost = $133,000,000	Total estimated present worth cost = $2,600,000,000 Estimated present worth O&M cost = $200,000,000	Total estimated present worth cost = $257,000,000 Estimated present worth O&M cost = $25,000,000	Total estimated present worth cost = $194,000,000 Estimated present worth O&M cost = $21,000,000
State/Tribal Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan					
Community Acceptance	To be completed following receipt of public comments on Proposed Plan					

Table 7-7
Comparison of Alternatives for Coeur d'Alene Lake

Criterion	Alternative 1 No Action	Alternative 2 Implement Lake Management Plan
Overall protection of human health and the environment	**Low** Potentially not protective of human health and the environment. Includes no measures to control nutrients, which may affect the rate of release of metals from the lake bed sediments.	**Medium** Potentially protective of human health and the environment. Includes measures to control nutrients, which may reduce the rate of release of metals from the extremely large volume of contaminated lake bed sediments compared to no action.
Compliance with ARARs	**Low** Potentially higher rate of release of metals compared to Alternative 2 may result in longer time to achieve AWQC.	**Medium** Potentially lower rate of release of metals compared to Alternative 1 may result in shorter time to achieve AWQC.
Long-term effectiveness and permanence	**Lowest** Includes no actions to reduce residual risk	**Medium** Includes measures to potentially reduce release of metals from lake bed sediments. Long-term reliability would depend on continued enforcement of institutional controls designed to reduce nutrient loads.
Reduction of toxicity, mobility, or volume through treatment	**Lowest** No treatment included	**Medium** Although specific sources have not been identified, the Lake Management Plan contains provisions for treatment of sources of nutrients.
Short-term effectiveness Protection of community, workers, environmental impacts Time to achieve RAOs	**Highest** No impacts to community, workers or environment **Low** Includes no actions to reduce the time to meet surface water RAOs	**Medium** Actions identified under the Lake Management Plan may result in risks to community and workers and environmental impacts. Medium- Reductions in nutrient loads would potentially reduce time to achieve surface water RAOs.
Implementability	**Highest** No implementability considerations	**Low** Implementation may require passage of new ordinances and coordination between agencies. There may be private property ownership issues for some actions.
Cost	Total estimated cost = $1,300,000 Estimated present worth O&M cost = $1,300,000	Total estimated cost = $8,800,000 Estimated present worth O&M cost = $8,800,000
State/Tribal Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan	
Community Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan	

Table 7-8
Comparison of Alternatives for the Spokane River

Criterion	Alternative 1 No Action	Alternative 2 Institutional Controls	Alternative 3 Containment with Limited Removal and Disposal	Alternative 4 More Extensive Removal, Disposal, and Containment	Alternative 5 Maximum Removal and Disposal
Overall Protection of Human Health and the Environment	**Lowest** Would not be protective.	**Lowest** May be ineffective in reducing risks to humans. Would not reduce risks to ecological receptors.	**Medium** Would effectively contain sediments posing risks to humans, and would effectively contain some, but not all, sediments posing risks to ecological receptors.	**Medium** Removal and disposal of sediments would provide more reliable protection of humans as well as ecological receptors in critical habitat areas compared to Alternative 3.	**Highest** Removal and disposal of all sediments posing significant human health and ecological risks would provide the most reliable protection.
Compliance with ARARs	**Lowest** Would not comply with ARARs for sediments.	**Lowest** Would not comply with ARARs for sediments.	**Medium** Would comply with ARARs for sediments. Generally doesn't satisfy MTCA preference for removal versus containment.	**Medium** Would comply with ARARs for sediments. Partially satisfies MTCA preference for removal versus containment.	**Highest** Would comply with ARARs for sediments. Satisfies MTCA preference for removal versus containment.
Long-Term Effectiveness and Permanence	**Not evaluated** Alternative does not meet the threshold criteria	**Not evaluated** Alternative does not meet the threshold criteria	**Low** Moderate residual risks to ecological receptors. Low residual risks to humans. Moderate maintenance requirements. Some additional actions due to recontamination could be needed.	**Medium** Low residual risks to humans and ecological receptors. Moderate maintenance requirements. Some additional actions due to recontamination could be needed.	**Highest** Very low residual risks to humans and ecological receptors. No long-term maintenance requirements. Some additional actions due to recontamination could be needed.
Reduction of Toxicity, Mobility, or Volume through Treatment			None of the alternatives include treatment		
Short-Term Effectiveness Short-term impacts to community and environment - Time to achieve RAOS			**Highest** Limited short-term impacts to community and environment resulting from hauling and construction activities within the floodplain. **Low** Longest time to achieve RAOs among the action-oriented alternatives.	**Medium** Limited short-term impacts to community from hauling, but potentially significant impacts to the environment from construction activities within the floodplain. **Medium** Second shortest time to achieve RAOs.	**Low** Limited short-term impacts to community from hauling, but most significant impacts to the environment from construction activities within the floodplain. **Highest** Shortest time to achieve RAOs
Implementability			**Highest** No significant technical or administrative feasibility concerns. Services and materials readily available.	**Highest** No significant technical or administrative feasibility concerns. Services and materials readily available.	**Medium** Potentially somewhat greater feasibility considerations due to larger scope of actions. Potential limitations on local landfill capacity.
Cost	Total estimated cost = $0	Total estimated cost = $900,000 Estimated present worth O&M cost = $890,000	Total estimated cost = $1,800,000 Estimated present worth O&M cost = $940,000	Total estimated cost = $6,500,000 Estimated present worth O&M cost = $1,300,000	Total estimated cost = $28,000,000 Estimated present worth O&M cost = $1,700,000
State/Tribal Acceptance	To be completed following receipt of state and tribe comments on Proposed Plan				
Community Acceptance	To be completed following receipt of public comments on Proposed Plan				

7.2 ECOLOGICAL PROTECTION IN THE UPPER BASIN AND LOWER BASIN

Some of the key issues for evaluating the ecological alternatives are:

- **Impacted sediments.** Impacted sediments are believed to be the major source of metals loading in the Basin. In the Upper Basin, tailings-impacted floodplain sediments and associated groundwater are the major sources of dissolved metals to the rivers and streams. In the Lower Basin, erosion of river bank and bed sediments is the major source of particulate lead. Over 100 million tons of impacted sediments are present in the Upper and Lower Basins. Large-scale cleanup of impacted sediments would be difficult and costly, presenting major technical and administrative challenges, as well as significant adverse short-term impacts. Likely impacts to the local communities and natural environment include increased truck traffic, dust and noise generation, potential disruption of services and recreation opportunities, and reduced aesthetic quality. Much of the sediment in the Upper Basin is not considered accessible due to its location beneath I-90 and other infrastructure. Private property ownership issues must also be addressed as a component of cleanup.

- **Time to achieve overall cleanup goals.** The time needed to achieve overall cleanup goals, including AWQC and risk-based sediment cleanup goals, will be lengthy and require a period of natural recovery for all alternatives. The probable time period decreases with the aggressiveness and completeness of the alternative.

- **Availability of materials.** The availability of materials for covering, backfilling, and revegetating waste piles, removal areas, and repositories is limited. These materials include topsoil (either natural or manufactured) and uncontaminated fill. Mining of native topsoil could create adverse environmental impacts at borrow locations.

- **Repository siting.** There are limitations on the availability of suitable sites for large engineered repositories for disposal of excavated or dredged contaminated media.

- **Long-term management and associated costs.** Any effective remedy would likely require substantial long-term management with associated costs. Institutional programs to protect human health and the environment would be needed. Depending on the remedy, long-term management may include operation and maintenance of engineered controls, such as repositories, and water treatment systems. Required periodic cleanups of remediated areas that are recontaminated by subsequent flood events would add to long-term management costs, as would the long-term monitoring and periodic site reviews required under Superfund.

Based on the comparative analysis, EPA believes Alternative 3 represents the best balance of tradeoffs for a long-term cleanup approach, as summarized in Table 7-6. Alternatives 3 and 4 provide substantially greater protection of the environment and shorter times to achieve compliance with ARARs than Alternatives 1, 2, 5, and 6. Alternatives 3 and 4 would result in more than twice the reduction of metals loads in surface water, as shown in Table 7-9, and provide much more safe feeding area for waterfowl and other receptors than the other four alternatives. Alternative 3 relies more on groundwater and surface water treatment to reduce dissolved metals loads from the Upper Basin and Mission Flats than Alternative 4, which relies more heavily on removals. In addition, Alternative 4 includes actions in areas (for example, waste rock piles that are not located near streams) that pose relatively little risk. Because it relies on extensive removals, Alternative 4 would likely be more difficult to implement than Alternative 3. As a result, Alternative 3 would be more cost effective, have fewer community and environmental impacts from excavation and trucking, and require less repository space and topsoil or growth media than Alternative 4.

Table 7-9
Estimated Effectiveness of the Ecological Alternatives for the Upper Basin and Lower Basin for Reducing Dissolved Metals Loads in the Coeur d'Alene River

Alternative	Percent Zinc Load Reduction at Completion of Remedy Implementation	
	Pinehurst	Harrison
4	73	64
3	62	57
2	30	26
5	13	12
6	8	9
1	0	0

The details of the evaluation can be found in Sections 5 and 6 of Part 3 of the FS for the Upper Basin and Lower Basin, respectively.

7.3 COEUR D'ALENE LAKE

Table 7-7 summarizes the comparative analysis of the alternatives for Coeur d'Alene Lake. The details of the evaluation can be found in Section 8 of Part 3 of the FS.

7.4 SPOKANE RIVER

Table 7-8 summarizes the comparative analysis of the alternatives for the Spokane River. The details of the evaluation can be found in Section 7 of Part 3 of the FS.

7.5 DEVELOPMENT OF THE INTERIM ACTION

The long-term cleanup goals for the Basin include full protection of human health and the environment. For environmental protection, the goals to meet the AWQC for protection of aquatic life and soil/sediment cleanup levels for protection of sensitive receptors will require a long-term, comprehensive remedial response because of the Basin's vast size and the massive and widely distributed extent of metal-contaminated material. Any long-term, comprehensive remedial response must also deal, in a practical manner, with the uncertainties associated with the complexity and variability of the various metal sources within the Basin and the remedial actions used to eliminate or control those sources.

EPA believes that these realities mean that the most appropriate way to implement the required long-term, comprehensive remedial response is incrementally, in an integrated process of successive actions over time. This incremental approach starts with existing information and progressively learns from experience as increments are implemented, monitored, and refined. This process can help assure that as progress toward the long-term cleanup goal for the Basin is made, actions could be prioritized within available funds and be cost-effective.

The interim action, which is described in detail in Section 8, thus represents the first increment in the long-term, comprehensive, remedial response required for meeting the goal of full protection of human health and the environment in the Basin. Specifically, the interim action would:

- Provide a cost-effective means for achieving protection of human health and the environment
- Allow cleanup activities for human health and environmental protection to proceed simultaneously
- Prioritize remediation of upstream sources while beginning actions in selected downstream areas
- Provide measurable, tangible benefits to humans and environmental receptors (e.g. fish, birds) within a relatively short time in the areas addressed
- Balance priorities identified by stakeholders (states, tribes, federal trustees, and the public)
- Build upon past remedial work performed by others
- Expend a level of effort annually that would allow the cleanup to efficiently move forward while applying the experience gained
- Moderate short-term environmental and socioeconomic impacts

- Take advantage of innovative, cost-effective technologies as they emerge

The interim action, as the first increment of a long-term comprehensive remedial response, is a prioritization of the numerous actions needed for protection of human health and the environment. This interim action constitutes EPA's Preferred Alternative. The specific actions and the anticipated benefits of these actions are described in detail in Section 8.

8.0 DESCRIPTION OF THE INTERIM ACTION

This section describes the interim action, which is identified in Table 8-1 and summarized in Table 8-2. The interim action was developed through comprehensive discussions among EPA, States, Tribes, Federal Trustees, and the public, including the state-led consensus-building process. The interim action consists of the priority actions proposed for the first increment of cleanup work. An overview of the interim action is provided below.

Human Health in the Affected Communities. The interim action includes all of the remedy for protection of human health in the communities and residential areas of the Upper Basin and the Lower Basin. No additional actions for protection of human health in community and residential areas are anticipated after completion of the interim action.

Upper Basin and Lower Basin Environmental Protection. For environmental protection, an incremental approach is proposed for the Upper Basin and the Lower Basin. The interim action consists of the first increment of cleanup, and the remedy consists of 20 to 30 years of prioritized Ecological Alternative 3 actions designed to achieve interim benchmarks for environmental protection. These actions would be implemented concurrently with the human health actions.

The interim action described in this plan includes interim benchmarks for ecological protection; however, the long-term goals are to provide full protection of the environment as well as to return the opportunity for individuals to practice subsistence lifestyles without limits from mining contamination. Based on existing information, EPA believes the level of cleanup effort of Ecological Alternative 3 will be needed to achieve the long-term goals of protection of human health and the environment and compliance with ARARs. Combined improvements from cleanup activities and natural recovery will be required to achieve ARARs. EPA intends to implement incrementally, in this and subsequent decision documents Ecological Alternative 3 or a remedy that complies with ARARs and is as protective of human health and the environment as Ecological Alternative 3. The interim action is consistent with this long-term approach.

Coeur d'Alene Lake. The Coeur d'Alene Lake is not included in the interim action. The governments are looking toward implementation of the Lake Management Plan by State, Tribal, and local agencies under separate legal authorities outside of the Superfund process to reduce the probability of additional metals movement from the sediments at the lake bottom into the lake water. A remedial decision for the lake under Superfund is being deferred until the Plan is fully in place and has been evaluated.

Spokane River. The proposed interim action for the Spokane River includes all of the human health remedy upstream of Upriver Dam and all of the environmental remedy from the Idaho/Washington border to Upriver Dam. Additional sampling is included in the Plan to determine the need to address areas upstream of the state line for environmental protection and downstream of Upriver Dam for human health and environmental protection.

Table 8-1
Feasibility Study Alternatives Used in the Interim Action

Area	Interim Action	Estimated Cost
Soil	Alternative S4: Information and Intervention and Partial Removal and Barriers	$85,000,000[1]
House dust	Alternative D3: Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning	$4,200,000
Drinking water	Alternative W6: Public Information and Multiple Alternative Sources	$2,200,000
Aquatic food sources	Alternative F3: Information and Intervention and Monitoring	$910,000
Ecological protection in Upper Basin and Lower Basin	20 to 30 years of prioritized Ecological Alternative 3 actions Upper Basin tributaries Lower Basin river banks and bed Lower Basin floodplains	$250,000,000,[2] including $100,000,000 $67,000,000 $81,000,000
Coeur d'Alene Lake	Not included in the interim action	
Spokane River	Combination of elements of Spokane River Alternatives 3, 4, and 5	$10,000,000

[1] Includes costs for 31 recreational areas in the Lower Basin
[2] Includes actions at mine and mill sites with human health concerns, as well as ecological concerns

The interim action includes the full remedy needed to protect humans from exposures that currently occur in the community and residential areas of the Upper Basin and Lower Basin, as well as at Spokane River recreational sites upstream of Upriver Dam. There are some current human health exposures outside of these areas, as well as some potential future exposures, that are not completely addressed. The following potential exposures would be addressed in future increments:

- Recreational use at all areas of potential use in the Upper Basin and Lower Basin
- Subsistence lifestyles, such as those traditional to the Coeur d'Alene and Spokane Tribes
- Potential future use of groundwater that is presently contaminated with metals

The priority actions included in the interim action are proposed to achieve the interim benchmarks (actions and criteria) established for the first increment of cleanup. Interim benchmarks are near-term goals that will serve as landmarks and measurements to evaluate the progress of the remedy toward achievement of the long-term goals. The interim benchmarks and prioritization of actions were based on knowledge gained during the RI/FS process and extensive

discussions with stakeholders. Table 8-2 lists the interim benchmarks for the first increment and the cleanup actions selected to achieve these benchmarks. Table 8-2 is organized by subunits of the Basin, which include the residential, community, and recreational areas of the Upper Basin and Lower Basin; the major tributaries in the Upper Basin; river beds, banks, and floodplains in the Lower Basin; Coeur d'Alene Lake; and the Spokane River.

The cleanup actions in the interim action would be sequenced. Some of the considerations for the sequencing of the cleanup include the following:

- Cleanup of areas of human health exposure is a top priority. It is anticipated that cleanup of these areas would be conducted concurrently with the ecological remedy and have a goal of completion in five years.

- Some cleanup actions related to ecological protection will require additional studies to fill data gaps prior to initiating the cleanup.

- Downstream areas subject to recontamination would generally be cleaned up after upstream sources of contamination are stabilized; however, cleanup in some downstream areas would be conducted prior to complete upstream source stabilization. Examples include beaches and other recreation areas and waterfowl feeding areas with high use and relatively low recontamination potential.

- The level of funding available will influence the rate and extent of cleanup actions.

The following sections describe the proposed interim action for protection of human health and the environment in the Coeur d'Alene Basin.

Table 8-2
Summary of the Interim Action

Area	Interim Benchmark	Actions
Community and residential areas	**Reduce lead concentrations in soil and dust such that the predicted risk (using the integrated exposure uptake biokinetic [IEUBK] Lead Model) to the individual child is at or below 5 percent of being above the CDC standard of 10 µg/dL and at or below 1 percent of being above the standard of 15 µg/dL.**[1] Reduce soil concentrations by partial removal and replacement of residential soils with lead concentrations above 1,000 ppm and control or limit migration of soils above 700 ppm. Reduce individual house dust lead concentrations and loadings (see Figure 8-4). **Attain MCLs for cadmium, lead, and arsenic in drinking water.**[1]	**Soil** Alternative S4: Information and intervention, community greening, partial removal, and barriers. Includes partial removal at an estimated 907 residences, vegetative barriers at an estimated 472 residences, and a combination of removals, barriers, and access restrictions at commercial and undeveloped properties and recreation areas.
		House Dust Alternative D3: Information and intervention, vacuum loan program/dust mats, interior source removals and controls, if necessary. An estimated maximum of 252 residences would require this additional cleaning, based on 1,000 mg/kg cleanup goal. This would be coordinated with paint abatement programs.
		Drinking Water Alternative W6: Public information and multiple alternative sources.
		Aquatic Food Sources Alternative F3: Information and intervention and monitoring
		Institutional Controls Manage contaminated material by protecting barriers put in place through establishment of an institutional controls program, which would include locally developed and enforced rules and regulations, disposal areas, clean fill sources, control of contaminated source areas and other considerations.
Estimated Cost = $86,000,000		

[1] The benchmarks for protection of human health are the same as the remedial action objectives.

Table 8-2 (Continued)
Summary of the Interim Action

Area	Interim Benchmark	Actions
Mill sites, waste piles, beaches, and other recreation areas with potential human health exposure	**Same as goals for soil and dust under communities and residential areas**	Prevent human exposure using a combination of access controls, decontamination, demolition, capping, and removals. For sites with ecological risks, use a remedy consistent with Ecological Alternative 3. Sites selected based on proximity to residential areas or high use recreational/community area. **Upper South Fork** Golconda, Morning No. 6, and National Mill **Canyon Creek** Standard-Mammoth Mill and Sisters Mine **Ninemile Creek** Day Rock Mill **Pine Creek** Upper and Lower Constitution Mine and Mill, Highland Surprise Mine and Mill, Nevada Stewart Mine, Hilarity Mine and Mill **South Fork** Hercules Mill, USBM impoundment, Coeur d'Alene Mill, and Silver Dollar Mine **Lower Basin** 31 recreational areas (see Figure 8-3)
Estimated Cost = $23,000,000		

Table 8-2 (Continued)
Summary of the Interim Action

Area	Interim Benchmark	Actions
Upper Basin	**Reduce potential for recontamination of downstream remedies and reduce metals load to Coeur d'Alene Lake and the Spokane River**	Stabilize stream beds and banks and dumps subject to erosion, implement runon/runoff controls, and construct sediment traps. Includes actions in Canyon Creek, Ninemile Creek, Pine Creek, and the South Fork.
	Reduce metals and nutrient loads from groundwater to the South Fork	Construct improvements to sewer and storm drain systems to reduce infiltration of contaminated groundwater.[2]
Estimated costs for stabilization actions are included under the watershed where the action would take place. Estimated cost for sewer and storm drain improvements = $12,000,000		
Canyon Creek	**Reduce metals toxicity to downstream aquatic receptors** Reduce dissolved metals load discharging to the South Fork by 66%[3]	Pilot and demonstration projects for treatment of creek water and groundwater near the mouth (permeable reactive barrier (PRB) or other technology, potentially including active technology components). Implement water treatment or other technology based on outcome of demonstration project.
	Reduce particulate lead and sediment loading during high flows	Conduct stabilization of stream banks and dumps (e.g., Tamarack, Omaha, Standard-Mammoth Loading Area, Hercules No. 5)
Estimated cost = $34,000,000		

[2] Funding sources for this action to be determined; may include non-CERCLA sources
[3] Load reduction would be accomplished using treatment of creek water near the mouth of Canyon Creek. Design flow for treatment system = 60 cfs, flows greater than 60 cfs bypassed without treatment. Assumed intake structure location near southern end of Hecla-Star tailings ponds and treatment pond location near southern end of Woodland Park Flats. Alternate or additional intake location could be at Standard-Mammoth millsite with treatment pond at Wallace Yard.

Table 8-2 (Continued)
Summary of the Interim Action

Area		Interim Benchmark	Actions
Ninemile Creek	East Fork headwaters to above Success	**Improve conditions to allow natural reestablishment of a salmonid fishery** Tier 2 to 3+ fishery (see fishery tier definitions at end of table). Reestablish fishery in 1.7 miles of 13 miles of streams in the Basin that are devoid of fish. Reduce dissolved metals concentrations to less than 7 times chronic AWQC with mitigation of mining impacts on riverine areas. **Protect riverine and riparian receptors** Mitigate mining impacts on riparian areas along 1.7 miles of stream.	Implementation of a remedy upstream of the Success based on Alternative 3: • All significant loading sources would be removed, contained, or treated (all except upland waste rock without erosion or leaching potential and adits discharging metals at concentrations <AWQC) • Impacted sediments and tailings placed in onsite or regional repository • Tailings impoundments provided with low-permeability cap • Waste rock subject to erosion or leaching consolidated and contained above the floodplain • Treatment of water from seeps and five adits • Hydraulic controls/treatment as needed for loads that are not controlled by removal or containment • Bioengineering to stabilize stream beds and banks to mitigate mining impacts on riverine and riparian zones • Potential additional actions at the Rex and Interstate mill sites, if needed to achieve interim benchmarks
	East Fork above Success to confluence	**Improve conditions to allow natural reestablishment of a migratory corridor for adult and juvenile fish** Tier 1 fishery. Reduce dissolved metals concentrations to less than 20 times acute AWQC.	Complete implementation of remedy at Success. Continue monitoring of Success. Based on the results of monitoring, additional actions may be required in this reach, potentially including partial or complete removal of the Success tailings and treatment of creek water near the mouth (permeable reactive barrier (PRB) or other technology, potentially including active treatment components).

Table 8-2 (Continued)
Summary of the Interim Action

Area		Interim Benchmark	Actions
Ninemile Creek	Mainstem Ninemile Creek from E.F. confluence to 0.75 miles downstream of Blackcloud Cr.	**Improve conditions to allow natural reestablishment of an adult salmonid fishery** Tier 2 fishery. Reestablish fishery in 1.5 miles of 13 miles of streams in the Basin that are devoid of fish. Reduce dissolved metals concentrations to less than 7 to 10 times chronic AWQC with mitigation of mining impacts on riverine and riparian areas.	Benchmarks would be achieved through actions taken upstream in East Fork.
	Mainstem Ninemile Creek from 0.75 miles downstream of Blackcloud Cr. to confluence with South Fork	**Improve conditions to allow natural reestablishment of a migratory corridor for adult and juvenile fish** Tier 1 fishery. Reduce dissolved metals concentrations to less than 20 times acute AWQC.	Benchmarks would be achieved through actions taken upstream in East Fork.
Estimated cost = $38,000,000 (includes additional actions at Success, Rex, and Interstate and treatment of East Fork creek water)			
Pine Creek		**Improve conditions to allow natural increases in salmonid populations and improve spawning and rearing** Tier 3+ fishery. **Protect riverine and riparian receptors** Mitigate mining impacts on riparian areas at locations of hot spot removal/capping.	Bank and bed stabilization and riparian zone revegetation, with remaining hot spot removals, including Upper and Lower Constitution Mine and Mill, Highland Surprise Mine and Mill, Nevada Stewart Mine, Hilarity Mine and Mill, and Little Pittsburg and Sidney on Denver Creek. Based on results of monitoring, remedy may include treatment of Denver Creek near its mouth to reduce metals load. Improve stream to mitigate environment impacts from mining, including regrading of stream reaches that go dry in the summer months.
Estimated cost = $6,400,000			

Table 8-2 (Continued)
Summary of the Interim Action

Area	Interim Benchmark	Actions
South Fork (Wallace to Elizabeth Park)	**Improve conditions to support a higher fish density** Tier 2+ to 3+ fishery at >0.1 fish/square meter **Initial protection of riverine and riparian receptors** Mitigate mining impacts on riparian areas at locations of hot spot removal/capping.	Stabilize and bioengineer stream channel and banks to protect riverine and riparian receptors, with associated hot-spot removals in upper floodplain.
Estimated cost = $4,800,000		
South Fork (Elizabeth Park to confluence including the Bunker Hill Box)	**Reduce metals loading to surface water**	Hydrogeologic investigation: surface water and groundwater monitoring and modeling. Coordination with remedial activities within the Box, which includes actions such as controlling loads to surface water from the CIA area and upgrading the central treatment plant (CTP)[4] Development of groundwater remedy alternatives.
Future actions in the Box are not part of this interim action.		

[4] Remedial actions for Bunker Hill Box are addressed in the separate Records of Decision (RODs) for this area.

Table 8-2 (Continued)
Summary of the Interim Action

Area	Interim Benchmark	Actions
Lower Basin Stream Banks and Beds, including the Harrison Delta (Riparian and Riverine)	**Reduce particulate lead loading in the river** Reduce lead load entering into Lake Coeur d'Alene and the Spokane River, with emphasis on peak discharge events. Estimated reduction in load needed is at least 50% to reduce year-round lead concentrations to below chronic AWQC in the Spokane River. **Reduce soil toxicity for songbirds, small mammals, and riparian plants** Mitigate risks to riparian receptors along 33.4 miles of river by removing contaminated bank wedges from a 30-foot wide zone (122 acres). Removing the contaminated bank wedges would enhance vegetation establishment. **Reduce human exposure (recreational and subsistence users)** Same as goals for soil and dust under communities and residential areas	Implement complete removal of contaminated bank wedges from highly-erosive areas. [5] Stabilize banks and revegetate removal areas to protect riparian zone ecological receptors and humans. Construct and operate sediments traps at four splay areas where the river overflows its banks during highflow conditions (Frutchey's field, Black Rock Slough, Strobl Marsh, and Medicine Lake) after implementing pilot study at one area. Implement periodic removal of river bed sediments in Dudley reach or other natural depositional areas identified during remedial design.[6]
Estimated cost = $67,000,000		

[5] Areas identified as requiring aggressive actions. Costs based on 176,383 lf (33.4 miles) with 2.3 cy/lf (approximately 30-feet wide).
[6] Assumes 500,000 cy initial dredging and 200,000 cy after 5, 10, 15 and 20 years (total of 1.3 million cubic yards).

Table 8-2 (Continued)
Summary of the Interim Action

Area	Interim Benchmark	Actions
Lower Basin Floodplain	**Wetlands: Reduce sediment toxicity and waterfowl mortality** Increase feeding area with lead concentration <530 mg/kg by 1,169 acres (of a total of 5,829 wetland acres with lead exceeding 530 mg/kg). Potentially increase feeding area by an additional 1,500 acres through conversion of agricultural land. **Lakes: Reduce sediment toxicity to diving ducks, dabbling ducks, and warm- and cold-water fishes** Reduce lead concentration in whole brown bullhead fish (as an indicator species) by remediating 1,859 of 5,979 acres of lake with lead exceeding 530 mg/kg. **Riparian: Reduce soil toxicity for riparian receptors** **Reduce human exposure (recreational and subsistence users)** Same as goals for soil and dust under communities and residential areas.	Reduce exposure using a combination of removals, capping, and soil amendments in areas of high waterfowl use, high lead, road access, and relatively low recontamination potential. Human health concerns would also be addressed in identified areas. These areas are: Lane Marsh 1 (wetland: 213 acres) Medicine Lake (wetland: 198 acres, lake: 230 acres) Cave Lake (wetland: 190 acres, lake: 746 acres) Bare Marsh (wetland: 165 acres) Thompson Lake (wetland: 300 acres, lake: 256 acres); Thompson Marsh (wetland 59 acres, lake: 122 acres) Anderson Lake (wetland 44 acres, lake: 505 acres). Identify agricultural and other areas (subject to landowner approval and further sampling) with lower levels of lead for cleanup to provide additional clean feeding areas (6 areas = 1500 acres). Uncontaminated capping materials may be obtained from within wetland areas (after removing surficial contaminated material) or from adjacent areas.
Estimated cost = $81,000,000		

Table 8-2 (Continued)
Summary of the Interim Action

Area	Interim Benchmark	Actions
Coeur d'Alene Lake (does not include the Harrison delta, which is included in the Lower Basin)	**Manage nutrient inputs to the lake to reduce the potential for release of heavy metals from lakebed sediments into the overlying lake water.** Attain goals for dissolved oxygen, total phosphorus, zinc, clarity, and coliform bacteria identified for the three lake management zones (nearshore, shallow southern lake, and deep, open-water zones) in the Lake Management Plan.	No CERCLA action currently identified in this interim action. Under separate state, federal, tribal, and local authorities, implement and fund the Lake Management Plan, or establish a similar plan, with authority. Implement long-term monitoring plan.
Funding to be provided by other state, local, and tribal entities		
Spokane River upstream of Upriver Dam	**Reduce human health and ecological exposures at selected shoreline sediment depositional areas.** Clean up sediment containing lead at concentrations greater than 700 mg/kg (sites with human health exposure). Clean up sediment containing lead at concentrations greater than 450 mg/kg or zinc at concentrations greater than 410 mg/kg (sites with ecological exposure). **Reduce concentrations of metals in surface water, moving toward achievement of AWQC**	**Shoreline sites.** Use a combination of capping, removals, and performance monitoring. **Upriver Dam sediments.** Remediate contaminated sediments stored behind Upriver Dam and conduct performance monitoring. Remedial actions directed at surface water load reductions in the Basin to reduce metals transport. Key remedial actions expected to reduce metals entering the Spokane River include the implementation of a Coeur d'Alene Lake water quality protection program, lower Coeur d'Alene River bed and bank remediation, and South Fork of the Coeur d'Alene River groundwater remediation actions, particularly within the Box near Kellogg.
Estimated cost = $10,000,000		

Table 8-2 (Continued)
Summary of the Interim Action

Area	Interim Benchmark	Actions
Spokane River within reservation	**Reduce concentrations of metals in surface water, moving toward achievement of tribal water quality standards** **Quantify risks to tribal members practicing traditional subsistence lifestyles and to ecological receptors**	Remedial actions directed at surface water load reductions in the Basin to reduce metals transport (see Spokane River actions above). Perform Tribal-Specific Human Health Risk Assessment
Basinwide remedy monitoring	**Measure basinwide effects of remedy implementation and coordinate all monitoring efforts in the Basin**	Establish and implement basinwide monitoring program
Estimated cost = $750,000 per year		

Fishery Tier definitions:
Tier 0: No fish present
Tier 1: No resident fish are present. Adult and juvenile salmonids (trout species) transit occasionally to reach spawning and rearing areas. Suggested concentration range for Tier 1 is 10x to 20x the acute AWQC.
Tier 2: Native or introduced salmonids are present, but with less than three year classes and generally low densities (less than 0.05 fish/ m^2). Sculpins are generally absent, or present at very low densities. The suggested concentration range for Tier 2 is 7x to 10x the chronic AWQC.
Tier 3: Three or more year classes of native or introduced salmonids are present. Fish densities are moderate to high (>0.05 fish/m^2) and young of the year fish, representative of spawning and rearing, are present. Sculpin are generally absent or present at very low densities. The suggested concentration range for Tier 3 is 3x to 7x chronic AWQC.
Tier 4: Three or more year classes of native or introduced salmonids are present. Fish densities are generally high (>0.10 fish/m^2) and **young of the year** (YOY) are present, which indicates successful spawning and rearing. Sculpin are present at moderate to high densities. The suggested concentration range for Tier 4 is 1x to 3x the chronic AWQC, however sculpin are usually absent or have reduced densities at the upper end of this range (i.e., Tier 3).
Tier 5: Three or more year classes of salmonids present at high densities (>0.10 fish/m^2), and include YOY and adult fish. The State of Idaho has set a range of 0.10 to 0.30 fish/m^2 as meeting beneficial use criteria for coldwater streams. A full range of native species predominate and are present at high densities. This Tier of fishery is typically found in undisturbed streams with metals concentrations below chronic AWQC.
+: Indicates that adult trout (>150mm length) were present during population surveys.

Table 8-2 (Continued)
Summary of the Interim Action

Notes:
CDC - Center for Disease Control and Prevention
ppm - part per million
MCL - maximum contaminant level
µg/L - microgram per deciliter

8.1 HUMAN HEALTH PROTECTION IN COMMUNITY AND RESIDENTIAL AREAS

Preventing excessive lead exposures in young children and pregnant women is a top-priority objective. Exposures to lead in soil and dust from the home and surrounding communities and from recreational areas are the primary human health concerns in the affected communities in the Basin. Table 3-1 shows the estimated number of residences with lead concentrations in yard soil that exceed the cleanup level. Additional human health concerns include lead in fish from the Lower Lakes and metals such as cadmium, arsenic, and lead in shallow drinking water wells in the side gulches and main valley of the Upper Basin and floodplain areas of the Lower Basin.

The interim action incorporates experience from successful cleanup actions within the Bunker Hill Box. Figure 8-1 shows how the percentage of children with blood lead levels greater than 10 µg/dL declined as yard cleanup progressed within the Bunker Hill Box using cleanup methods very similar to those proposed for the Basin.

Interim actions were developed for soil, house dust, drinking water, and aquatic food sources, as shown in Tables 8-1 and 8-2.

Soil, House Dust, and Intervention Programs

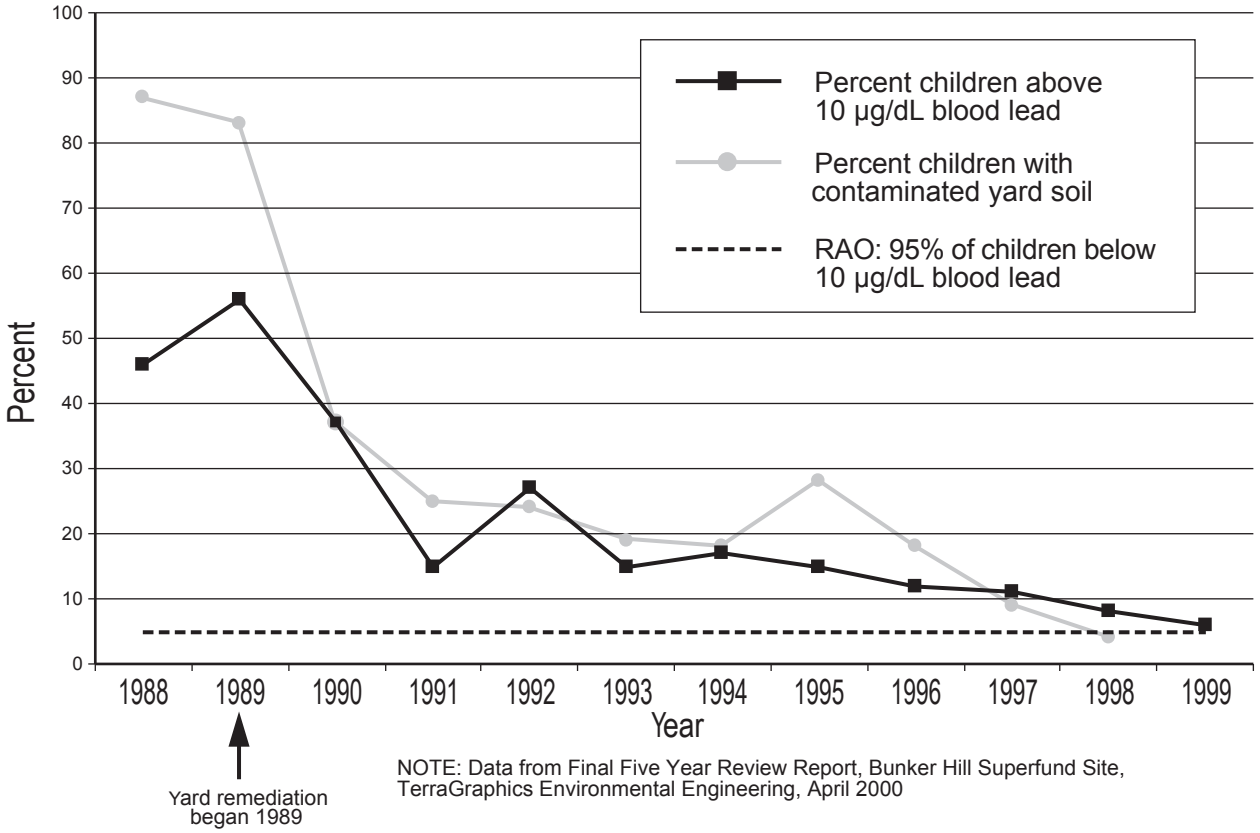
The ultimate remedy for childhood exposure to lead is prevention. The importance of preventing lead exposure has been highlighted by recent studies indicating adverse health effects at blood lead levels below 10 µg/dL and showing that prevention is more effective than treatment to prevent cognitive impairments in exposed children. (For further information and research on blood lead levels in children, please see the list of related literature at the back of this proposed plan.)

Young children are primarily exposed to lead in dust on the floors of their homes. Lead in house dust reflects contaminated soil from the yard, neighborhood, and surrounding community. Preventative actions include source removal and containment inside and outside the home. A long-term basinwide institutional controls program would be implemented to maintain the integrity of the human health remedy after it is implemented.

The proposed soil cleanup level is 1,000 ppm lead for partial removal and a soil barrier on residential yards and common use areas. Soil with lead concentrations between 700 ppm and 1,000 ppm would require a barrier, such as vegetation, to prevent exposure and distribution of dust. Yard soil with lead concentrations greater than 1,000 ppm would be removed to a depth of one foot and backfilled with clean soils (two feet in garden areas, or one foot of excavation with

Figure 8-1

Trends in Children's Blood Lead and Children with Contaminated Yards
Bunker Hill Box, 1988-1999



NOTE: Data from Final Five Year Review Report, Bunker Hill Superfund Site, TerraGraphics Environmental Engineering, April 2000

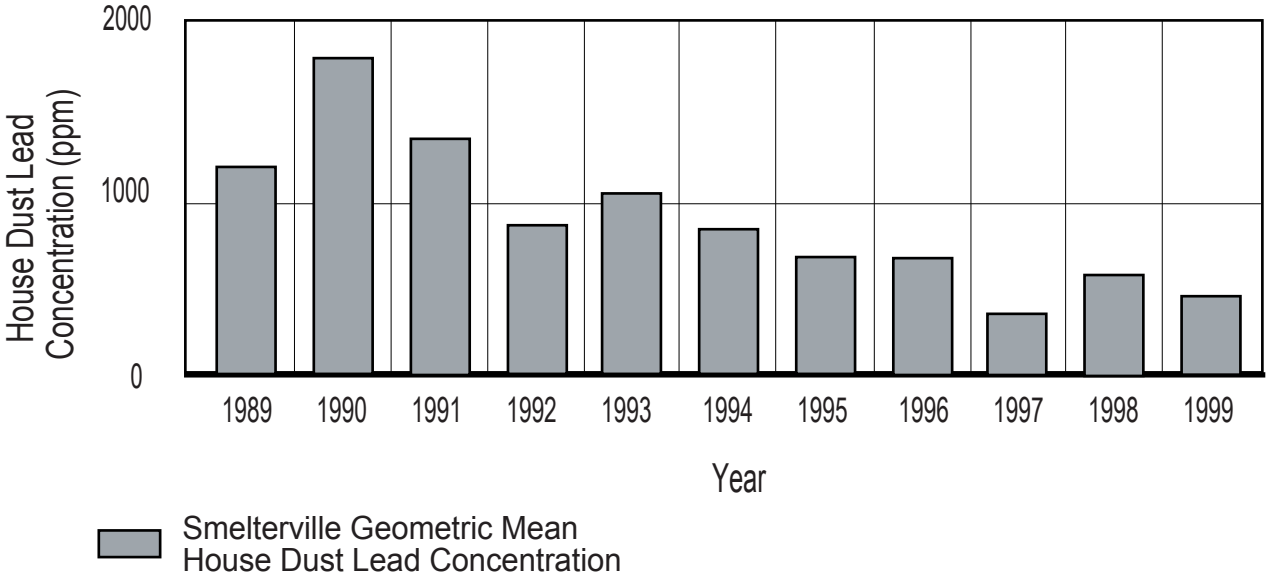


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Figure 8-2

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Decline in House Dust Lead Concentration in Smelterville

two feet of capping to create a raised garden). Where appropriate, the exteriors of structures would be pressure-washed before remedial measures are performed to reduce the potential for recontamination from lead-based paint. This would be coordinated with the Department of Housing and Urban Development paint abatement programs. Programs for paint abatement and stabilization would be incorporated with the soil cleanup and sequenced to mitigate exposures as quickly as possible while balancing this against limiting the possibility of recontamination. Suitable barriers to lead-contaminated soil and dust in common use areas, such as streets, alleys, rights-of-way, mine and mill sites, and playgrounds, include removal, capping, and vegetation.

It is expected that covers of one foot of clean soil or vegetation would substantially reduce lead concentrations inside each home. Based on the Human Health Risk Assessment of 2000, contaminated yard soil removal has been shown to be effective in reducing house dust concentrations in the Bunker Hill Box for a large number of homes; this house dust concentration reduction co-occurred with a substantial drop in blood lead levels in children, as shown in Figure 8-2.

The estimated costs include drainage improvements to ensure that contaminated material from areas yet to be cleaned are not transported to remediated areas. These drainage improvements will maintain the long-term protectiveness of the partial removals.

Formal recreational areas such as boat ramps, picnic areas, and campgrounds with surface soil containing lead concentrations of greater than 700 ppm would be capped. Soils in recreational areas may also be excavated, if appropriate. Figure 8-3 shows the locations of the 31 recreational areas in the Lower Basin that have been identified for cleanup.

In addition to cleanup actions, an intervention program similar to the Panhandle Health District's Lead Health Intervention Services would provide personal health and hygiene information and vacuum cleaner loans to help mitigate exposure to contaminants. Blood lead monitoring would be offered to identify and treat families with excessive lead exposures. Nursing follow-up services and sampling of yards and homes would be available.

It is estimated that there is a small percentage of properties in the Basin with arsenic above 100 ppm that are not collocated with lead above 1,000 ppm and would require cleanup. In addition, recreational areas with arsenic levels in excess of 100 ppm would be prioritized for cleanup based on use. Arsenic and other mine-waste-derived metals exceeding **maximum contaminant levels** (MCLs) and action levels in tap water from wells would be addressed through the implementation of Alternative W6.

For the limited number of homes for which lead levels in interior dust are not adequately reduced by exterior remediation actions, a contingency of interior cleaning and paint abatement (available via a state program) would be available (FS alternative D3). The procedure that would be followed to determine whether contingency actions would be needed is shown in Figure 8-4. It is expected that, as yard cleanups are completed, only a percentage of the homes that currently exceed the dust loading criteria in Figure 8-4 would require evaluation, and even fewer would require cleaning. Costs estimates for dust abatement of these homes are based on the Smelterville house cleaning pilot study. The unit costs are expected to decrease if a lower level of cleaning proves to be effective, and by the economy of scale of cleaning a larger number of homes.

Before yard cleanup is completed, the intervention program would include monitoring dust levels and lead concentrations in homes with young children or pregnant women. The monitoring data would be used to direct nurse visits before lead exposure and blood lead concentrations are at their height in the late summer. This targeted education effort would be an added measure to mitigate exposure while the cleanup process is ongoing.

Relocation is proposed as a last resort for homes with contamination above action levels, where extensive recontamination is likely, or where adequate cleanup would be extremely difficult. For the vast majority of homes that fall above the action level, every effort will be made to find a way to ensure that the preferred soil alternative is effective in the long term. The governments will work with families and property owners to find the best solution for each individual.

Drinking Water

To reduce current exposure to metals in drinking water, an alternate water supply would be provided to residences or areas where the existing water supply contains metals at concentrations greater than the state drinking water standards. Residences with affected private wells within water districts would be connected to the existing public water supply system. For residences outside of water districts (mostly in the tributary gulches), the alternate water supply would most likely consist of point-of-use treatment or new groundwater wells installed into a suitable aquifer. Actions for protection of groundwater and potential future drinking water supplies are not addressed as part of this interim action.

EPA is in the process of re-evaluating the MCL for arsenic. EPA will evaluate the cleanup level for arsenic if a new MCL is promulgated to ensure that the remedial action remains protective of human health.

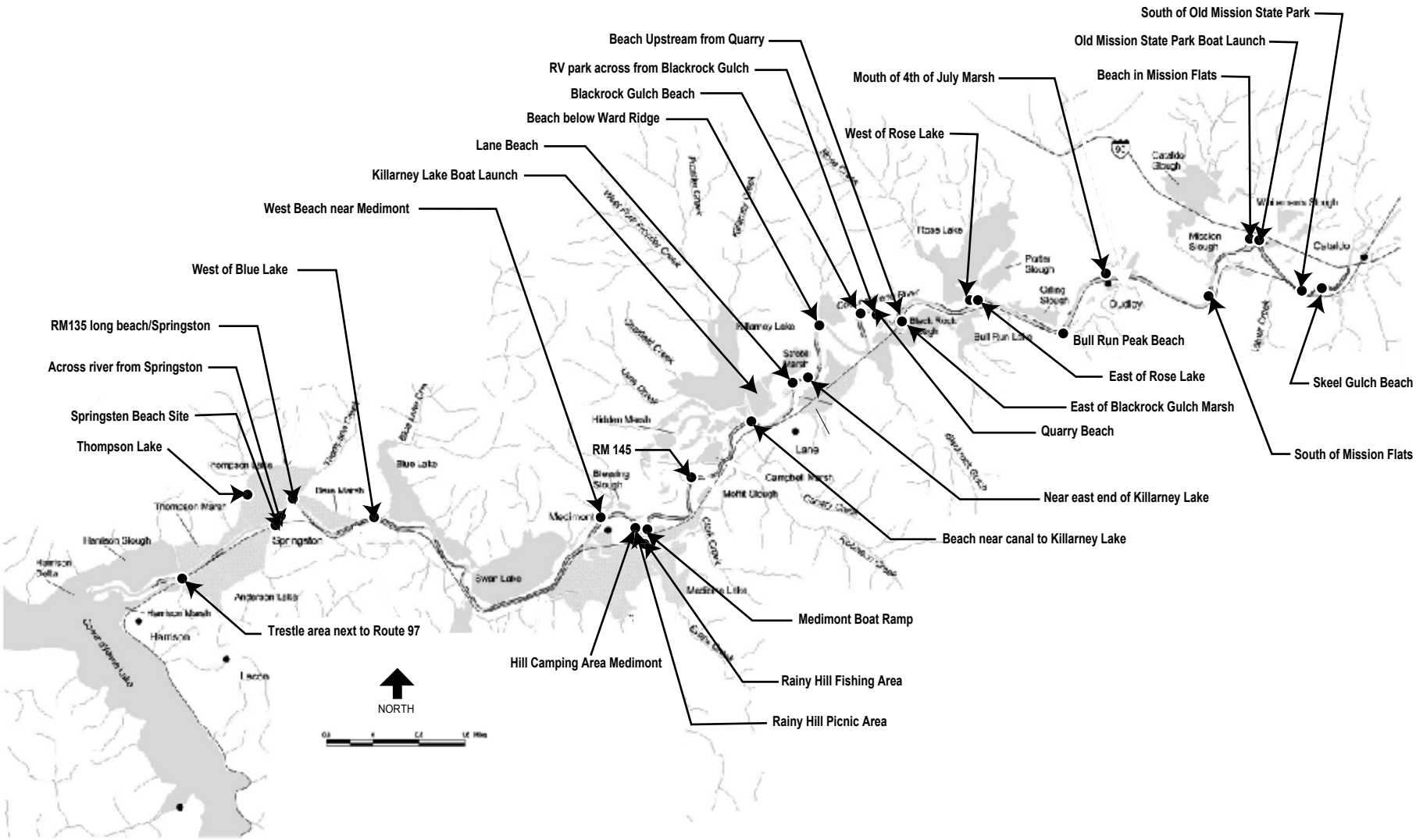

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Figure 8-3

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Lower Basin Recreation Areas

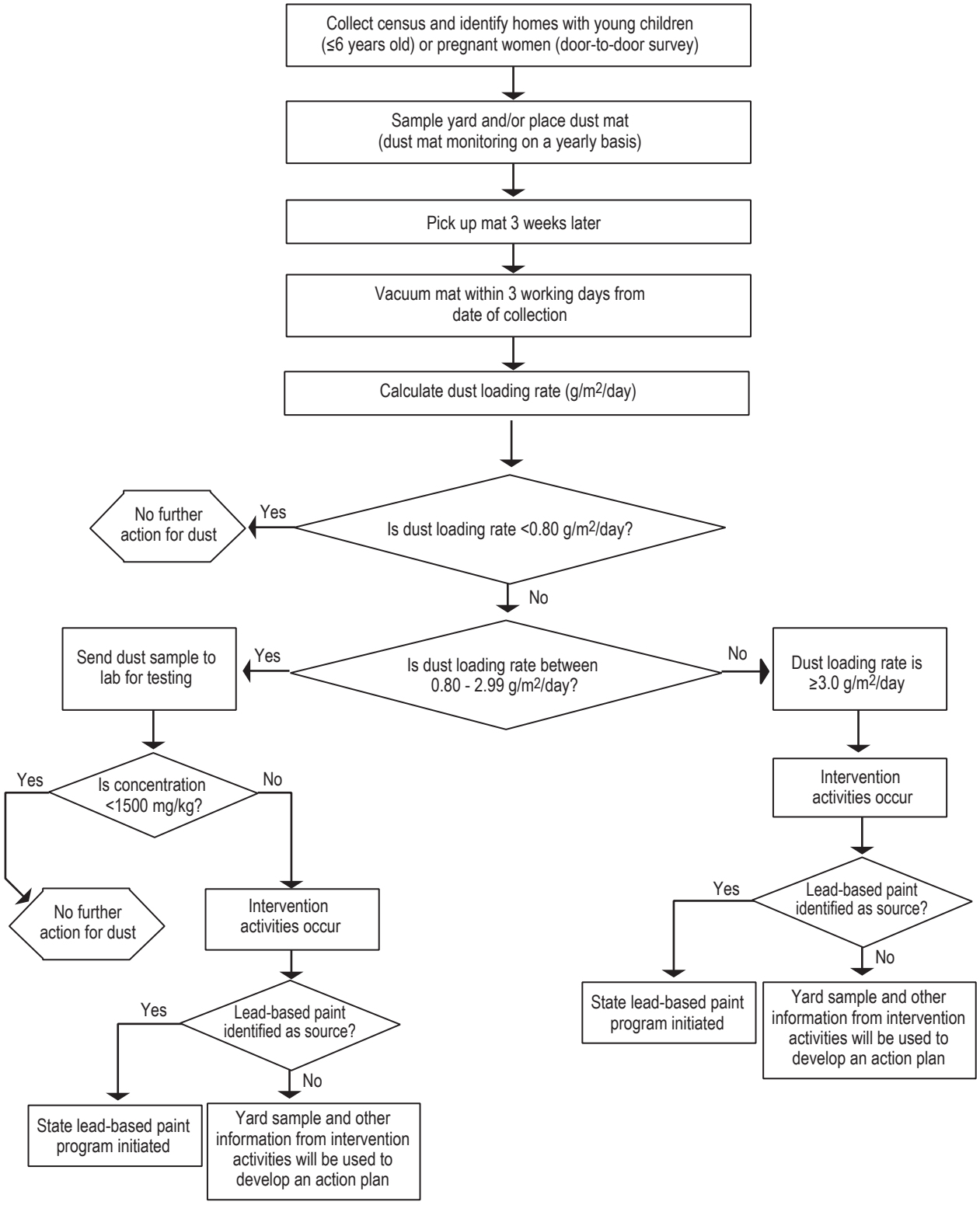

Figure 8-4

Flow Diagram of Dust Mat Monitoring Protocol

Aquatic Food Sources

Under this interim action, the potential for lead exposure by consumption of fish and other aquatic food sources would be managed through educational resources available to fishermen and other recreational users and health advisories for subsistence fishing. The educational resources and advisories would have information about the potential health risk of consuming contaminated fish caught from lateral lakes. A fish consumption advisory already exists in the Lower Basin and along part of the Spokane River. The proposed interim action also includes sampling of fish fillets and whole fish. Reductions in the levels of metals in fish are expected to occur as a result of implementation of the ecological remedies but may not be sufficient to adequately reduce human health risks in the short term.

8.2 ENVIRONMENTAL PROTECTION IN THE UPPER BASIN AND LOWER BASIN

EPA intends to implement, incrementally, with this and subsequent decision documents, Ecological Alternative 3 or a remedy that complies with ARARs and is as protective of human health and the environment as Ecological Alternative 3. As the increments are implemented, additional information would become available, and the specific actions taken could differ from those currently presented in the FS under Ecological Alternative 3.

EPA used the information included in the RI/FS and the administrative record to identify those cleanup actions from Ecological Alternative 3 that could be implemented within a 20- to 30-year period and would maximize protection of the environment, ARAR compliance, effectiveness, implementability, and cost effectiveness. EPA intends to monitor the results of the actions to assure that future increments would benefit both in implementability and effectiveness from lessons learned in the first increment.

Priority issues were grouped into three areas as an initial primary focus with respect to environmental protection:

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams**. High concentrations of these metals have harmful effects on aquatic receptors, including fish, as described in Section 4.

- **Lead in floodplain soil and sediment**. Existing lead contamination has harmful effects on waterfowl and other ecological receptors, as described in Section 4.

- **Particulate lead in the surface water**. Lead transported downstream in the river system is a continuing source of contamination for the Coeur d'Alene River, Coeur d'Alene Lake, and the Spokane River. Lead transported in the river system has impacted recreational areas in the Lower Basin and the Spokane River,

resulting in posted health advisory signs at beaches and swimming areas. During flood events, lead transported by the river also impacts the wetlands and floodplains. The potential exists for future particulate lead transport and recontamination of recreation and feeding areas cleaned up as part of the interim action.

These three priority issues represent the primary environmental problems in the Basin. The prioritized actions of the interim action were identified based on their potential to achieve interim benchmarks for reduction of environmental impacts related to these three priority issues. These actions were incorporated into the interim actions for Ninemile Creek, Canyon Creek, Pine Creek, the South Fork, and the lower Coeur d'Alene River, as well as associated riparian areas, lateral lakes, wetlands, and agricultural areas in the Lower Basin.

In addition to environmental protection, the actions described in the following sections would have significant human health benefits, particularly for children who recreate in the Lower Basin and individuals who would choose to practice a subsistence lifestyle. The potential exposure pathways include ingestion or dermal contact with soil and sediment at beaches and other common use areas; ingestion of native vegetables; ingestion of fish caught in Basin waters; exposure to soil at waste piles; and ingestion of untreated surface water. The Panhandle Health District has identified children with very elevated blood lead levels whose exposure was traced to use of beaches and recreational areas in the Lower Basin.

Based on what is currently known, an extended period of natural recovery would be required to fully achieve ARARs throughout the Basin. However, substantial improvements to the health of the ecosystem are expected in a shorter time period as the cleanup measures outlined in the following sections are implemented.

Dissolved Metals in Rivers and Streams

High levels of dissolved metals, particularly zinc and cadmium, exist in the river system in the Basin. The Upper Basin is the primary source of dissolved metals. Dissolved metals concentrations and impacts from mining currently prevent the river system from fully supporting aquatic receptors, including native fish.

This widespread occurrence of tailings-impacted sediments will make it difficult to reduce dissolved metals concentrations throughout the entire Basin to levels that comply with federal and state water quality standards and fully support some sensitive native fish species. However, further improvements to the ecosystem can begin in the short term through implementation of the interim action and continue for many decades by combining subsequent remedial actions with natural recovery. Implementing the interim action will allow some localized portions of the impacted areas to return to levels that would greatly improve the ecosystem.

For the first 20 to 30 years of remediation, the interim benchmark is to reduce dissolved metals to concentrations that allow substantial improvement to the fisheries and the ecosystem of the South Fork and some of its tributaries. Fish and aquatic organisms that are more tolerant of metals than native fish could return more quickly. The population and species diversity of fish and aquatic organisms are expected to continue to improve as cleanup progresses in the Basin. To the degree practical, as actions affecting surface water quality are implemented, adjacent riparian and riverine areas would be addressed in order to protect species that inhabit these areas.

Priority areas for the proposed interim action have been identified based upon where the most load reduction can be practically achieved and where the best chances exist for re-establishing a sustainable trout fishery, with an emphasis on native fish. Initial target areas for reducing dissolved metals are Ninemile Creek and Pine Creek. In addition, Canyon Creek is a target area for reducing metals loads to the South Fork. Overall, the interim action would be expected to achieve about 75 percent of the dissolved metals load reduction in the Upper Basin that would be anticipated from full implementation of Ecological Alternative 3 for about 20 percent of the estimated cost of Ecological Alternative 3. Table 8-2 identifies candidate interim benchmarks for reducing dissolved metals in streams and improving fisheries in these watersheds.

Ninemile Creek. Currently, Ninemile Creek is essentially devoid of fish in the area of mining impacts. The interim benchmark for Ninemile Creek is to improve conditions to allow natural re-establishment of a **salmonid** fishery, with an emphasis on native species, and migration corridors in the East Fork and mainstem. The fishery would not necessarily include the presence of metals-sensitive species (such as the bull trout), reproduction, or the presence of juveniles. Because current metals concentrations are higher in the reach of the East Fork from the Success mine downstream to the confluence with the mainstem, it is not anticipated that re-establishment of a fishery in this reach would occur as a result of the first increment of cleanup. The interim benchmark for this reach is to improve conditions to enable migration of fish between the upstream reaches and the mainstem.

The interim action in Ninemile Creek would include cleanup of all significant dissolved metals sources in the reach upstream of the Success mine site. This cleanup has been initiated by the mining companies and the State of Idaho with the work at the Interstate Mill Site, as well as the planned cleanup actions by BLM at the Rex. In addition to reductions in metals concentrations in the creek water, the cleanup would be designed to mitigate mining impacts on the riverine and riparian zone to protect fish, migratory birds, and other animals. An additional 1.7 miles of low-risk riverine and riparian area would be gained from the cleanup. The cleanup would also need to address improvements for fish passage at the mouth of Ninemile Creek. Areas proposed for cleanup during the interim action are shown in Figure 8-5.

The ability to achieve a fishery in the mainstem of Ninemile Creek is contingent on reducing sources of metals in the reach that includes the Success Mine site. The Silver Valley Natural Resource Trustees are currently conducting a pilot groundwater treatment project at the Success site. Depending on how successful the pilot project is, additional actions in this reach could

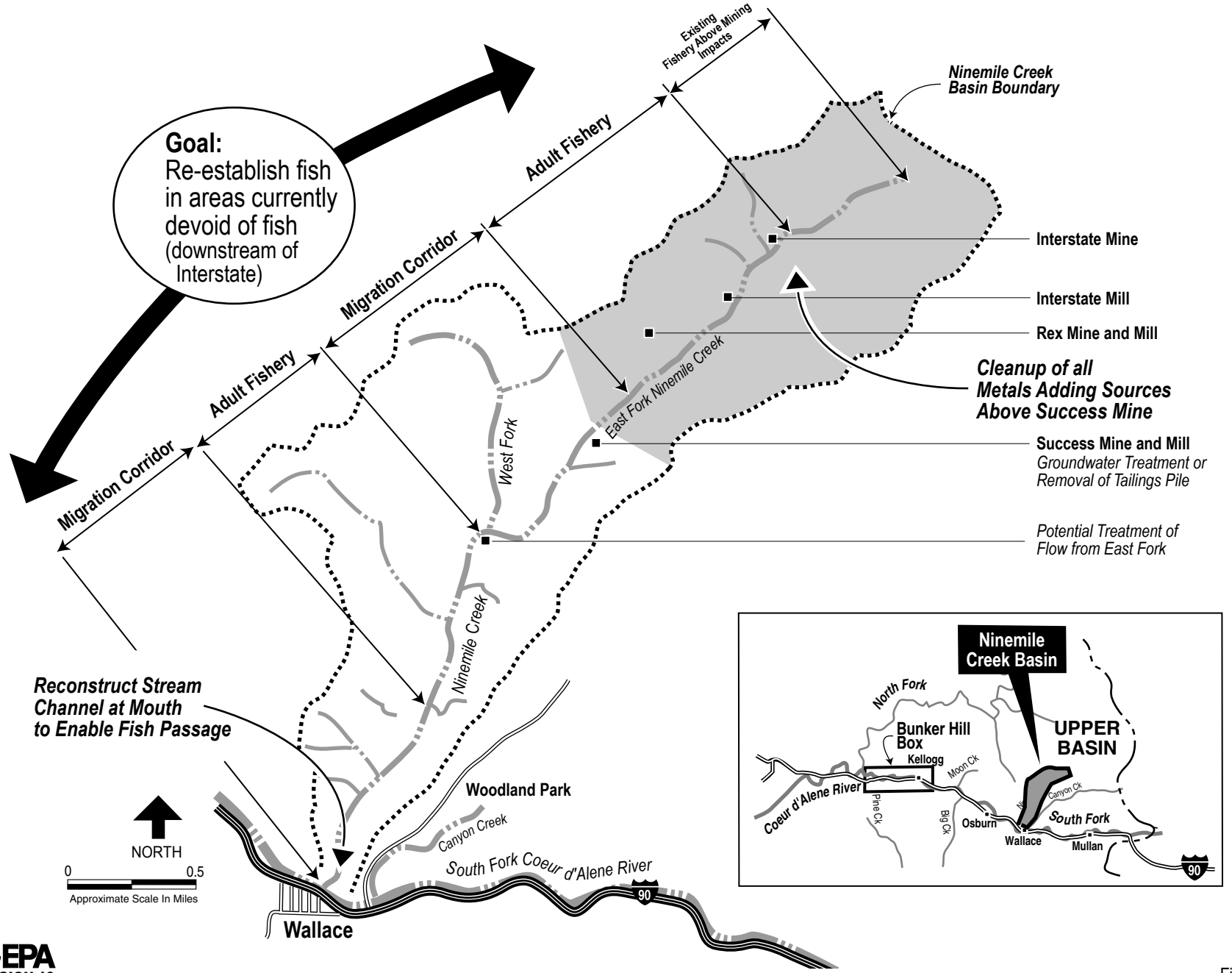

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Figure 8-5

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Ninemile Creek Cleanup Actions and Fisheries Status After Implementation of the Interim Action

include scale-up to full-scale treatment at the Success, relocation of the Success tailings pile, or construction of a treatment pond to remove metals from the creek water. The interim action would include monitoring of the removal actions at the Interstate, Rex, and Success to ensure these actions are consistent with the interim benchmarks.

During the development of the proposed priority actions included in the interim action for Ninemile Creek, EPA, in consultation with stakeholders, evaluated other potential response actions. From this evaluation, it was concluded that cleanup of additional sites (for example, remote waste-rock piles) in the East Fork of Ninemile Creek would contribute little to the development of fisheries and would not be cost-effective. The mainstem of Ninemile Creek is a much smaller source of dissolved metals than the East Fork and is the location of infrastructure and private development. Because of these factors, it was concluded that cleanup actions in this area would be less implementable and cost-effective than actions in the East Fork at this time.

Conversely, EPA, in consultation with stakeholders, concluded that a less comprehensive level of cleanup would have a low probability of reducing dissolved metals concentrations to levels that would support the interim benchmarks of re-establishment of a salmonid fishery and migratory corridors. Existing removal actions (for example, in Canyon Creek) have suggested that cleanup limited to hot spots would not achieve an adequate reduction of metals loading, at least in the short term. In addition, the East Fork was identified as an area to test strategies for cleanup (e.g., treating contaminated groundwater at the Success site using **apatite**, controlling specific mine waste sources, and creating a fish corridor). The lessons learned could be applied to the cleanup of other tributaries.

The long-term goals for Ninemile Creek include the return of a fully-functional native fishery and full protection of riparian zone birds and animals. It is expected that additional cleanup actions on the mainstem and an extended period of natural recovery would be needed to achieve the long-term goals in Ninemile Creek.

Pine Creek. Considerable cleanup work has already been conducted in the Pine Creek watershed, particularly by the BLM. Pine Creek currently supports an adult fishery, including brook trout and a smaller population of native cutthroat trout. However, populations and reproduction in some reaches of the creek are limited, primarily by stream structure and riparian zone conditions that have been degraded by mining impacts, with metals concentrations being a secondary limiting factor.

The interim benchmark for Pine Creek is to improve conditions to allow natural increases in salmonid populations, with an emphasis on native fish, and to improve conditions to allow for spawning and rearing.

Areas identified for cleanup during the interim action are shown in Figure 8-6. The actions implemented in the Pine Creek watershed would build on the work already conducted by the

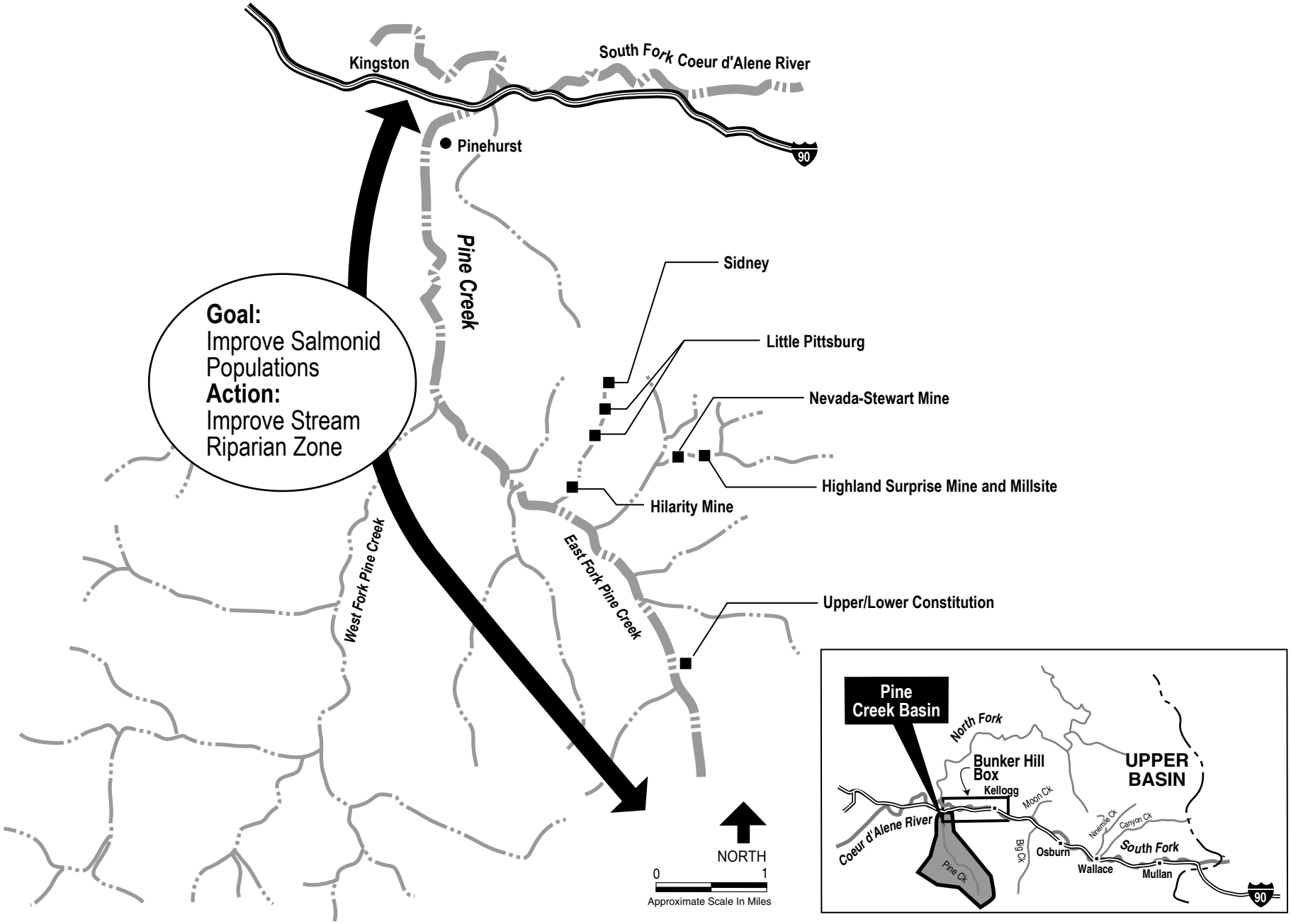

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Figure 8-6

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Pine Creek Cleanup Actions and Fisheries Status After Implementation of the Interim Action

BLM. Actions would include bank and bed stabilization and riparian zone revegetation to mitigate the effects of mining impacts. The actions would also include hot spot removals within the stream and at former mine and mill sites, including the Upper and Lower Constitution, Highland-Surprise, Nevada-Stewart, Hilarity, Little Pittsburg, and Sidney (Denver Creek). Several of these sites (Upper and Lower Constitution, Highland Surprise, Nevada-Stewart, and Hilarity) are also a concern for protection of recreational users. As with Ninemile Creek, lessons learned while implementing the interim action in Pine Creek can be readily applied to other areas in the Basin requiring additional cleanup.

During the development of the proposed priority actions included in the interim action for Pine Creek, EPA, in consultation with stakeholders, evaluated other potential response actions. Dissolved metals concentrations in Pine Creek are currently much lower than in Ninemile Creek and Canyon Creek, and it was concluded that the cleanup of sites that are smaller sources of metals discharges than those included in the interim response would not be necessary at this time to achieve the interim benchmarks of increasing salmonid populations and improving spawning and rearing conditions. Cleanup of many of the smaller sources would be needed in subsequent increments to eventually achieve compliance with the AWQC.

Conversely, it was concluded that a lower level of cleanup would be ineffective in reducing metals concentrations from current conditions (10 to 20 times the AWQC in the East Fork) to conditions needed to achieve the interim benchmarks (less than 7 times the AWQC to support a salmonid fishery). Mitigation of mining impacts would be needed to provide stream structure and riparian zone conditions supportive of the interim benchmarks for fisheries improvements, as well as to provide protection of riparian zone animals. A lower level of cleanup would also not be protective of recreational users at former mine and mill sites.

The long-term goals for Pine Creek include the return of a native fishery and full protection of riparian zone birds and animals. It is expected that additional cleanup actions and a period of natural recovery would be needed to achieve the long-term goals in Pine Creek.

Canyon Creek. Canyon Creek is essentially devoid of fish below Burke as a result of high metals concentrations and severely degraded riverine and riparian conditions. Canyon Creek contributes more dissolved metals load to the South Fork than any other tributary, approximately 20 to 25 percent of the load in the South Fork at its confluence with the North Fork. The interim benchmark for Canyon Creek is to substantially reduce dissolved and particulate metals loads to the South Fork.

Implementation of a source-by-source cleanup in Canyon Creek would be very difficult, costly, and time consuming. Hence, the proposed interim action in Canyon Creek would focus on identifying the most cost-effective technologies for improving downstream water quality by monitoring completed removal actions and conducting pilot technology tests and full-scale treatment projects. One potentially cost-effective approach that will be evaluated is to intercept the creek water in lower Canyon Creek and remove metals using passive treatment. Under this

approach, the individual metals sources would not be addressed during the first increment of work. Should treatment prove feasible after pilot studies, full-scale treatment would be implemented as part of the interim action of work in Canyon Creek. The development of innovative and potentially cost-effective water treatment in Canyon Creek would be effective in achieving desired reductions and potentially have application in other parts of the Basin (e.g., Ninemile Creek).

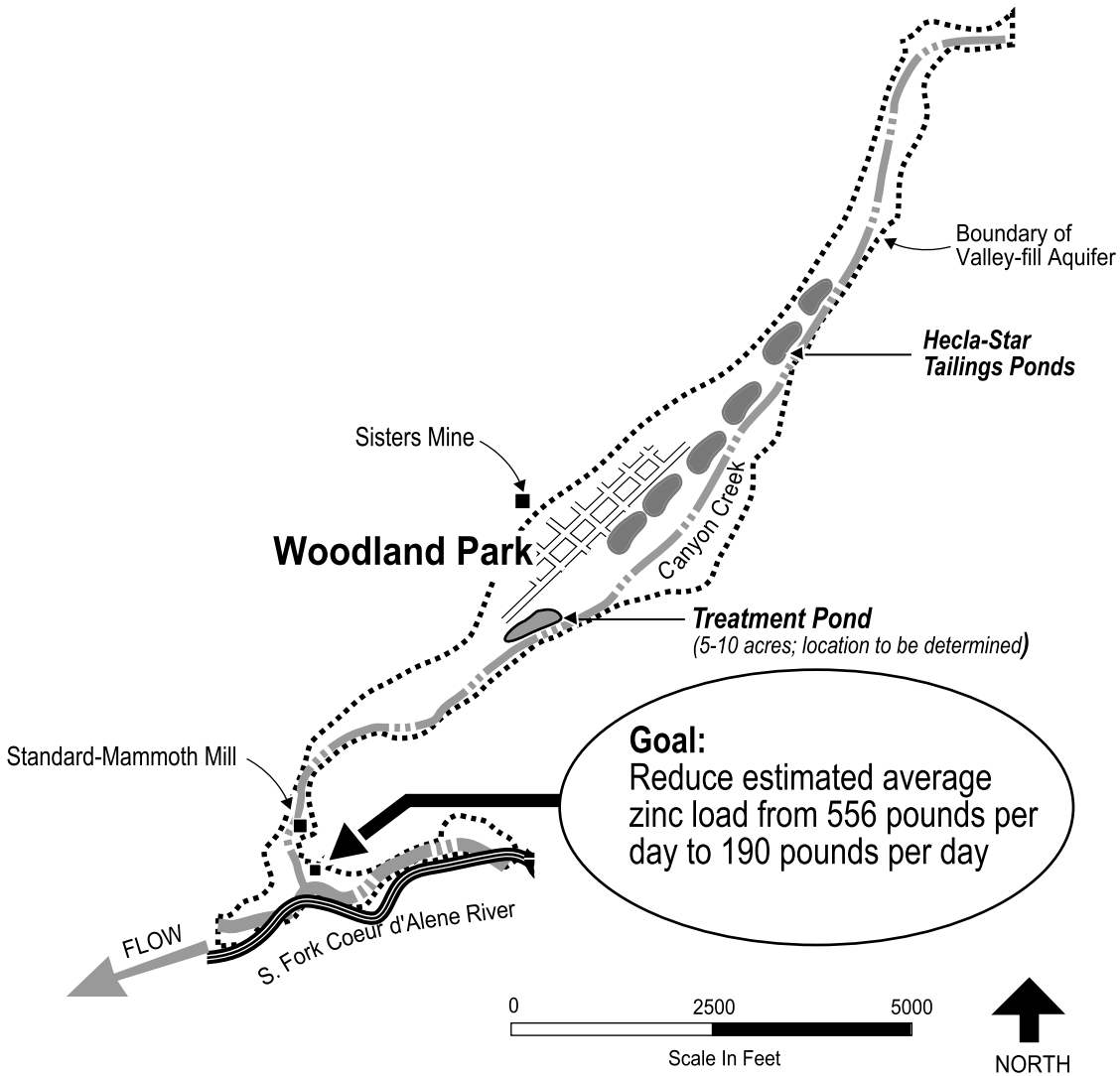
If passive treatment does not prove feasible, alternative treatment and control systems would be implemented. Because this approach would not achieve the long-term goal of ecosystem recovery within Canyon Creek, additional work would be necessary in Canyon Creek during subsequent increments of remedy implementation to achieve AWQC throughout the tributary. The design of the additional actions would benefit from experience gained through implementation and monitoring of cleanup in Ninemile Creek and Pine Creek.

The actions implemented in the Canyon Creek watershed during the interim action would also include protection of human health at the two former mine and mill sites where potential exposures were identified (Standard-Mammoth mill and Sisters mine). Areas identified for cleanup in the interim action are shown in Figure 8-7.

Additional actions may also be needed at the Burke concentrator. This site is currently fenced to limit access. The potential exists that some or all of the site may be preserved for its historical value. Should people be allowed on the site as a result of the historical preservation, or should access otherwise become available, cleanup actions would be needed to limit exposures to metals.

During the development of the proposed priority actions included in the interim action for Canyon Creek, EPA, in consultation with stakeholders, evaluated other potential response actions. Canyon Creek is the source of 20 to 25 percent of the dissolved metals load in the South Fork, and a relatively large reduction of metals load from Canyon Creek would be needed to meet the interim benchmark for improvements in the South Fork fish migration corridor, as well as to meet benchmarks for reductions in dissolved metals concentrations in the Spokane River. A source-by-source cleanup in Canyon Creek was considered; however, this approach would be difficult to implement within the 20- to 30-year timeframe of the interim action. In addition, based on removal actions conducted to date, the effectiveness of this approach would be uncertain. It would also be costly.

Not controlling the metals loading from Canyon Creek was also considered. Not controlling the metals loading from Canyon Creek would result in continued significant and unacceptable metals discharges to downstream waters and would not contribute to achieving the interior benchmark of improving the fisheries and ecosystem of the South Fork or reducing dissolved metals concentrations in the Spokane River.



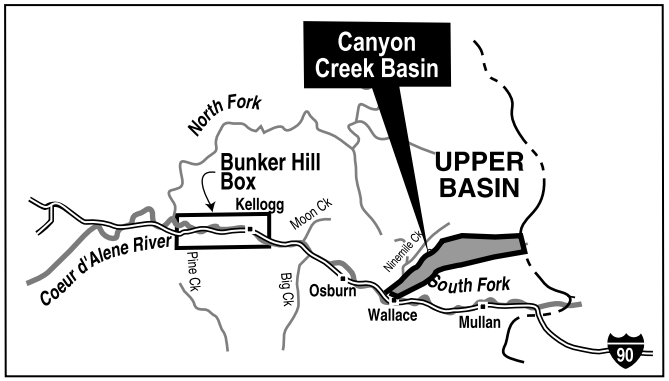


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Figure 8-7

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Canyon Creek Cleanup Actions

The long-term goals for Canyon Creek include the return of a native fishery and full protection of riparian zone birds and animals. It is expected that additional cleanup actions and an extended period of natural recovery would be needed to achieve the long-term goals for Canyon Creek.

South Fork. The proposed interim action along the South Fork (in areas outside of the Bunker Hill Box) would include cleanup at seven sites that also have potential human health exposures:

- National Millsite
- Morning No. 5 Mine and Millsite
- Golconda
- Hercules Millsite in Wallace
- Coeur d'Alene Millsite
- U.S. Bureau of Mines Impoundment
- Silver Dollar Mine

Tailings "hot spots" in the floodplain of the South Fork would be excavated and disposed of. Streamside actions would include stabilization and bioengineering of the stream channel and banks. These actions would enhance the South Fork as a migratory corridor for fish by increasing the amount of pools and shade, and would protect animals that inhabit the riparian zone.

During the development of the proposed priority actions included in the interim action for the South Fork, EPA, in consultation with stakeholders, evaluated other potential response actions. Sediments and associated groundwater are the primary source of dissolved metals originating from the South Fork floodplain. More extensive metals reductions would involve removal or containment of sediments that would be difficult to access due to their depth or their location beneath infrastructure or private property. These additional actions were not considered readily implementable or cost-effective at this time for achieving the interim benchmark of improving the South Fork as a fish migration corridor.

Conversely, removal of the remaining accessible floodplain hot spots, as is planned during the interim action, would be readily implementable and cost-effective for reducing dissolved metals load and increasing protection of human and animals that use these areas. A lower level of cleanup than is proposed for the interim action would also not be protective of humans potentially exposed to metals at the seven former mine and mill sites identified for cleanup.

As with Ninemile, Canyon, and Pine Creeks, lessons learned while implementing the interim action in the South Fork can be readily applied to other areas in the Basin requiring additional cleanup.

The long-term goals for the South Fork include the return of a native fishery and full protection of riparian zone birds and animals. It is expected that additional cleanup actions and an extended period of natural recovery would be needed to achieve the long-term goals for the South Fork.

Other Areas. Improvements in water quality in the river system will be strongly dependent on reductions in metals loading achieved in areas along the South Fork, including the Bunker Box. Approximately one-half of the dissolved metals load in the South Fork above the North Fork confluence comes from the river reach that includes the Bunker Hill Box. Actions taken to date within the Bunker Hill Box are expected to result in improvements in water quality; however, it is anticipated that additional actions will be needed to meet cleanup goals. These additional actions would likely include control of metals loading from groundwater to surface water, including the reach adjacent to the CIA. The EPA plans for these actions to be included in future RODs or amendments to RODs for the Bunker Hill Box and to coincide with the interim action.

Lead in Floodplains Soil and Sediment

Soil and sediment throughout the floodplains of the lower Coeur d'Alene River Basin are contaminated with lead that has washed downstream over the years from Upper Basin mining activities. Sediments are also remobilized and transported into Coeur d'Alene Lake and the Spokane River. Lead-contaminated sediments in the floodplains (including wetlands, bottom sediment of the lateral lakes, and low-lying upland areas) have caused adverse effects to wildlife. Notably, waterfowl (e.g., tundra swan and ducks) ingest highly contaminated sediment to the extent that many have suffered toxic effects or died from ingestion of lead. The USFWS has documented numerous deaths among tundra swan in these areas.

A long-term goal is to reduce metals exposure of plants, wildlife, and fish throughout these areas to levels that are protective of the ecosystem. Because the total contaminated floodplain area in the Lower Basin is so large, it is important to prioritize areas to improve specific, priority areas within the ecosystem locally. For example, one interim benchmark is to reduce waterfowl mortality by providing additional safe feeding areas. Site-specific data from waterfowl feeding studies indicate a lead cleanup level of 530 mg/kg in sediment for protection of waterfowl. It was recognized that all areas needing long term cleanup could not be addressed effectively in the interim action. Resource agencies have identified high-priority areas in the Lower Basin based on high use by waterfowl, high levels of lead in sediments, site access, and relatively low potential for recontamination during flood events. The areas identified as top priorities are:

- Thompson Lake (300 acres of wetland area and 256 acres of lake area)
- Thompson Marsh (59 acres of wetland area and 122 acres of lake area)
- Bare Marsh (165 acres of wetland area)
- Medicine Lake (198 acres of wetland area and 230 acres of lake area)
- Lane Marsh (213 acres of wetland area)
- Cave Lake (190 acres of wetland area and 746 acres of lake area)
- Anderson Lake (44 acres of wetland area and 505 acres of lake area)

The areas identified for cleanup during the interim action are shown in Figure 8-8. An additional goal of the interim action is to increase the amount of safe feeding areas by identifying and cleaning up some areas that are currently used for agriculture. These actions would be taken in cooperation with the current owners. It is estimated an additional 1,500 agricultural acres may be cleaned up. In total, about 4,500 acres of safe waterfowl feeding areas could be provided by the cleanup actions taken during the interim action.

A combination approach is envisioned for these areas, depending on the specific conditions (e.g., depth of contaminated sediments) within a given wetland or lake. Contaminated materials would be excavated from some areas and transported to an upland repository or consolidated within the lateral lake being cleaned up. Other areas would be capped with a layer of clean soil to prevent feeding birds from becoming exposed to metals. If feasible, capping materials could be obtained from clean subsurface sources within the wetland unit, with the possible result of creating deeper ponded areas to increase feeding opportunities for waterfowl and fish. Soil treatment to reduce lead **bioavailability** may be applied in selected areas if effective treatment technologies are identified in pilot tests underway this year.

The interim action focuses on cleaning up sediments in the portions of the lateral lakes where the water depth is six feet or less. These water depths represent the highest use feeding areas and, consequently, the areas of greatest exposure to waterfowl and other animals. Monitoring of the effects of the cleanup would include measuring the concentrations of lead in brown bullhead fish. The brown bullhead has been identified by the USFWS as the best indicator species for the ecological health of the lakes. Should lead concentrations in the brown bullhead remain elevated following completion of cleanup and waterfowl mortalities continue, the need for additional actions would be evaluated.

Although the areas identified for cleanup during the interim action have relatively low recontamination potential, some recontamination potential does exist. Hydraulic controls (floodgates) and levees could be used to limit recontamination of treated areas. These structures could have effects on the overall hydrology of the river/floodplain system. The need for these types of structures and their effect on the hydrology of the river/floodplain system would be evaluated during remedial design.

During the development of the proposed priority actions included in the interim action for mitigation of the impacts of lead in floodplain areas, EPA, in consultation with stakeholders, evaluated other potential response actions. Cleanup at additional areas was evaluated, including:

- Harrison Slough
- Blue Lake
- Black Lake

- Swan Lake
- Blessing Slough
- Moffit Slough
- Hidden Marsh
- Campbell Marsh
- Killarney Lake
- Strobl Marsh
- Lane Marsh (only partially addressed in the interim action)
- Black Rock Slough
- Bull Run
- Porter Slough
- Rose Lake
- Orling Slough
- Cataldo Slough
- Mission Slough

Although important areas to address in the future, these areas were not included in the interim action because of higher recontamination potential and poorer access. The scope of actions implementable in the 20- to 30-year response timeframe was also limited by the need to further develop and verify effective, implementable methods of reducing lead exposure and recontamination. The use of management techniques to discourage waterfowl feeding at contaminated areas also was also considered. These techniques were not included in the interim action because of concerns about reliability and the limited extent of alternative feeding areas for waterfowl.

The scope of cleanup included in the interim action reflects a minimum increment of implementable work toward achieving protection of waterfowl and other animals over the 20- to 30-year timeframe, as well as a first step toward protection of birds covered under the Migratory Bird Treaty Act.

It is expected that sediment deposited in these wetlands would decrease in metals content over time as a result of cleanup of the Upper Basin, the river banks of the mainstem Coeur d'Alene River, and, to a lesser extent, the bed of the river. If the metals content of sediments decreases with time, recontamination would be less important for these future wetlands cleanup efforts.

An important goal is full return of cultural resources and recreational uses in the Basin. Remedies that address wetland risks to waterfowl would also address potential human exposures at water potato grounds and recreational beaches. The use of institutional controls, such as warning signage, in the Lower Basin is not preferred as the long-term solution.

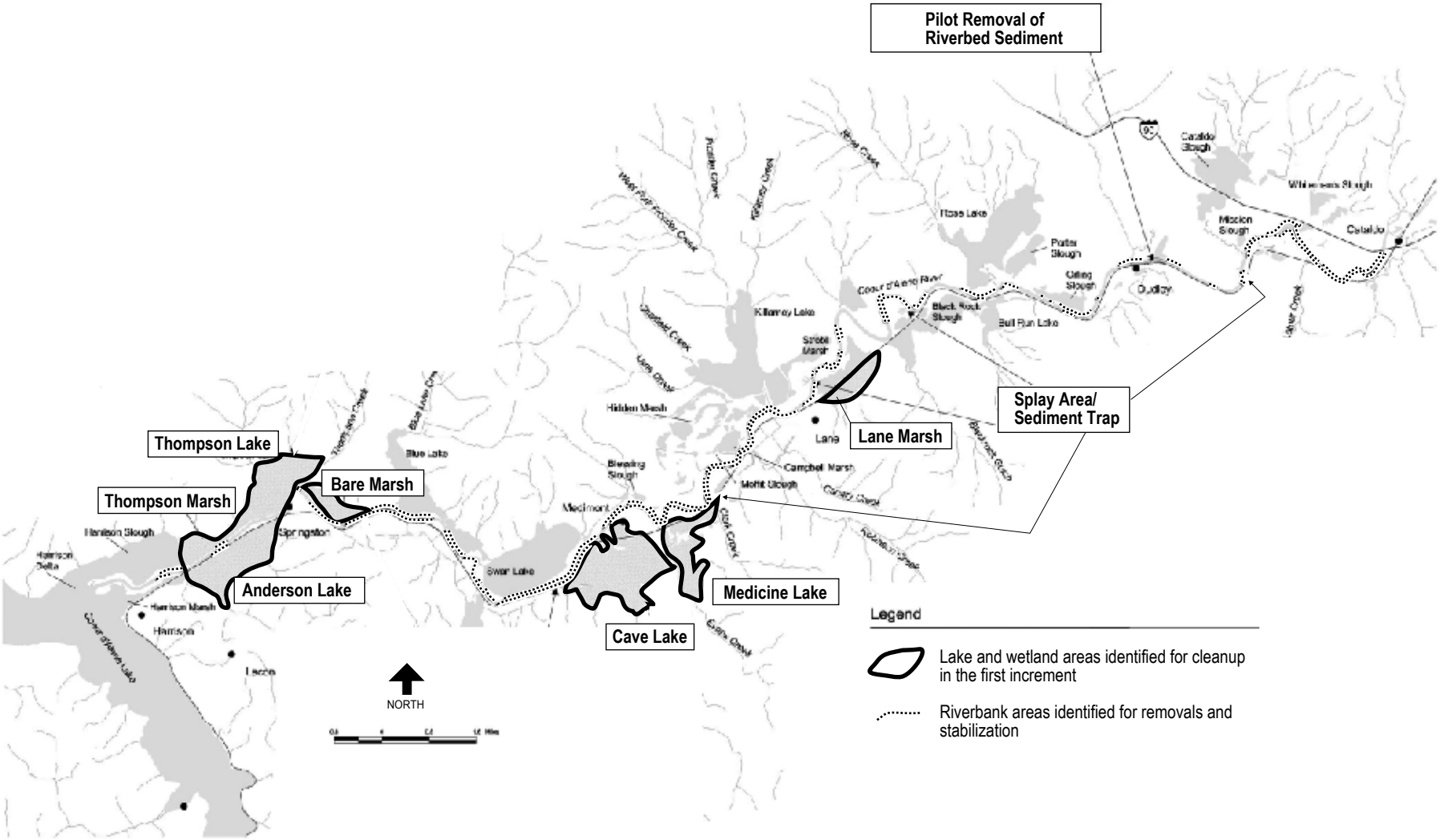

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Figure 8-8

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Lower Basin Cleanup Actions

Particulate Lead in Surface Water

Lead-bearing sediment in surface water is transported downstream to Coeur d'Alene Lake and the Spokane River, and washes across and contaminates the floodplain during flood events. Three sources are suspected to contribute the major particulate lead load in the Lower Basin: sediment derived from the Upper Basin, contaminated river bank sediments in the Lower Basin, and river bed sediments in the Lower Basin. The banks in many areas of the Lower Basin are steep and actively eroding into the river. River bed sediments have become contaminated from materials transported from upstream and from the eroding river banks. A portion of this sediment is entrained during high flow events, transported downstream in the river, and deposited in the floodplain.

An interim action and long-term goal is to reduce the lead load in sediment transported and deposited in downstream areas of the Lateral Lakes, Coeur d'Alene Lake, and Spokane River. This is necessary to minimize recontamination of cleaned areas, prevent the occasional exceedances of drinking water standards in Coeur d'Alene Lake, protect wildlife from exposure, and reduce lead concentrations and AWQC exceedances in the water of the Spokane River.

Initially during the interim action, the proposed cleanup action would focus on areas with the most actively eroding river banks. The reaches for bank stabilization will be prioritized based on the degree of erosion occurring and the concentrations of metals in the riverbank sediments. Remedial actions would include a combination of bioengineering and removals, as appropriate, to allow re-establishment of a sustainable river ecosystem. The extent of removal of contaminated material would be determined by the concentrations of metals in the river bank material, the likelihood that stabilized banks will remain stable in the future, site accessibility, and the presence of infrastructure. About 33 miles of river banks that are highly susceptible to erosion are targeted for stabilization during the interim action. In addition to reducing particulate lead loading to the river, these actions would increase the area of low-risk riparian area adjacent to the river in these reaches. Redeposition of metal-enriched sediment onto remediated river banks would be evaluated as part of the remedial actions.

Cost-effective methods for river-bed sediment removal will also be evaluated during the interim action. The natural depositional areas around Dudley and the Cataldo Mission have been identified as potential sites for interim action sediment removal operations. The Dudley area is the location of relatively thick deposits of sediment containing high concentrations of lead. Fine-grained sediment from the South Fork and North Fork accumulates at this location. The area around the Cataldo Mission acts as a natural trap for coarser-grained sediment from the North and South Forks, which usually contains less lead.

Sediments naturally accumulate in areas where the river leaves its bank during flood events. During the interim action, the feasibility of engineering these areas (referred to as "splays") as natural traps for sediment transported during flood events would be evaluated through pilot studies.

Monitoring of the potential improvements resulting from pilot-scale and full-scale remedial actions during the interim action will guide the continuing and future implementation of cost-effective remedies for the Lower Basin.

During the development of the proposed priority actions included in the interim action for particulate lead in surface water, EPA, in consultation with stakeholders, evaluated other potential response actions. Additional removal or stabilization actions, including banks less susceptible to erosion, was evaluated, but was considered less cost-effective for the interim action. More complete removal of river-bed sediment was also evaluated, but was not included in the interim action because of the following considerations:

- The potential for short-term water quality impacts from sediments suspended during large-scale removal activities
- The availability of repository space for the contaminated sediment removed from the river beds
- The potential for recontamination of the river bed by sediments from eroding banks and upstream sources

EPA, in consultation with stakeholders, also evaluated a narrower scope of interim actions. No action for river-bed sediments was evaluated; however, the bed sediments are potentially a large source of particulate lead, which, when deposited in the lateral lakes during flood events, has had severe effects on waterfowl. It was considered necessary to begin removing some of the most highly-contaminated sediments to reduce future downstream effects, as well as to begin developing cost-effective, implementable methods of sediment removal. Removal or stabilization of less length of contaminated river bank was also evaluated; however, removal of banks that are highly susceptible to erosion, as is proposed under the interim action, would be relatively implementable and cost-effective and would increase protection of birds and animals in riparian areas. In addition, stabilization of less erosion-susceptible bank would likely result in a greater risk of downstream recontamination compared to the interim action.

8.3 COEUR D'ALENE LAKE

The sediments at the bottom of the lake contain mining contamination, and the rate of release of metals in the sediments into the water column could increase if the lake water quality deteriorates due to nutrient enrichment. Currently, however, more metals enter the lake annually from the Coeur d'Alene River than flow out of the lake into the Spokane River. This and other information indicate that the lake sediments are a smaller source than riverine inputs. Based on currently available information, active remediation (e.g., dredging, capping) of lakebed sediments is not warranted. Furthermore, contaminated material excavated from other areas would not be disposed of in the lake.

Rather than active remediation of the lake, cleanup efforts would focus on reducing riverine inputs that continue to contribute to contamination of the lake and the Spokane River. The Coeur d'Alene Tribe, IDEQ, and EPA, along with others, plan to coordinate a comprehensive lake monitoring program to evaluate the effects of upstream cleanup, potential sources of contamination, and potential impacts to the lake and the Spokane River. If conditions change or new information that modifies the current understanding becomes available, additional actions will be evaluated. The following paragraphs describe the rationale for adopting this approach.

The beaches and wading areas adjacent to the Coeur d'Alene Lake and the Idaho portion of the Spokane River were sampled in 1998 and were found to be safe and did not exceed risk-based levels for recreational use. People using other beach areas for swimming, wading, sunbathing, etc. do not need to be concerned about health effects from exposure to mining contamination. Because the beaches were found to be safe, no cleanup will be needed in these areas.

The only exception is Harrison Beach, which is the subject of cleanup as part of the UPRR action. Any residual contamination at Harrison Beach would be addressed as part of the interim action.

The water in Coeur d'Alene Lake meets the safe drinking water standard for metals, except when the Coeur d'Alene River flows are high (e.g., during high spring run-off or during flood events), which causes short-term lead concentrations that exceed drinking water standards. The water in the lake also exceeds the water quality standards for some metals (e.g., cadmium and zinc and intermittently for lead), posing a potential risk to fish or other aquatic life. Improvements to the lake water quality are expected to result from cleanup in the Upper Basin and Lower Basin.

Some questions have been raised regarding the need to further evaluate potential risks to humans who eat whole fish or fillets taken from fish in the lake. Previous fish tissue sampling efforts did not include whole fish from Coeur d'Alene Lake and only a limited number of fillets were sampled. As a result, some uncertainty remains about the potential risks resulting from eating fish from the lake. Additional fish sampling is anticipated in 2002.

Based on existing information, there does not appear to be mining-related contamination in the residential and commercial areas of the cities of Coeur d'Alene, Harrison, and Post Falls; therefore, no cleanup will be needed in these areas other than the scheduled cleanup of Harrison Beach.

State, tribal, federal, and local governments are currently in the process of implementing a lake management plan outside of the Superfund process using separate, regulatory authorities to reduce the probability of metals being released from the sediments at the lake bottom. Consequently, EPA is not proposing additional Superfund actions for Coeur d'Alene Lake in this interim action. A remedial decision for the lake under Superfund is being deferred until actions by others are fully in place and have been evaluated.

If EPA and the parties agree that the lake management plan is being implemented and is providing adequate environmental protection, EPA could then proceed with CERCLA decision-making and with the process for removal of the Superfund designation from the lake. Deletion of areas from the Superfund list requires concurrence from the state and tribal governments in which the release was located.

8.4 SPOKANE RIVER

For the Spokane River, a limited number of sediment and soil sites in and adjacent to the Spokane River have been identified for cleanup on the basis of potential human and ecological exposures. The sites are located along a 16-mile reach of the river between the Idaho/ Washington state line and Upriver Dam, which is upstream of the city of Spokane. The identified areas include 10 shoreline sites and also a subaqueous site where sediment has accumulated directly behind Upriver Dam. The areas are shown in Figure 8-9.

The proposed interim action to protect human health and the environment at these areas draws from Spokane River Alternatives 3, 4, and 5. The interim action includes a combination of access controls, capping, and removals for the shoreline sites. The remedy to cleanup contaminated sediments behind Upriver Dam will be established following further study and engineering evaluation. Dredging or capping are the options anticipated for sediments behind the dam.

There is some potential for recontamination of the proposed shoreline cleanup sites. Fine-grained, metal-rich sediments coming from the Coeur d'Alene River Basin and metal-rich sediments previously deposited along the upper river may come to rest on remediated locations. Because of this concern, a phased approach is proposed. The locations initially remediated can be monitored for recontamination and cleanup work modified as necessary. If recontamination is a problem, the location involved may undergo periodic follow-up contaminant removal or maintenance of the clean-soil cover.

Other actions along the Spokane River proposed in this Plan include water-quality monitoring, aquatic-life monitoring, remedial-performance monitoring of sediments, and contingencies for additional or follow-up cleanups. Other than the proposed cleanup actions for impacted shorelines and sediments, measurable improvements to water quality in the river must rely primarily on actions performed upstream. Thus, the degree and duration of potential recontamination or the measurement of improvements to ambient surface-water quality will be closely tied to the pace and scope of the cleanup actions in the Lower and Upper Basin as well as the long-term retention of metals in Coeur d'Alene Lake sediments.

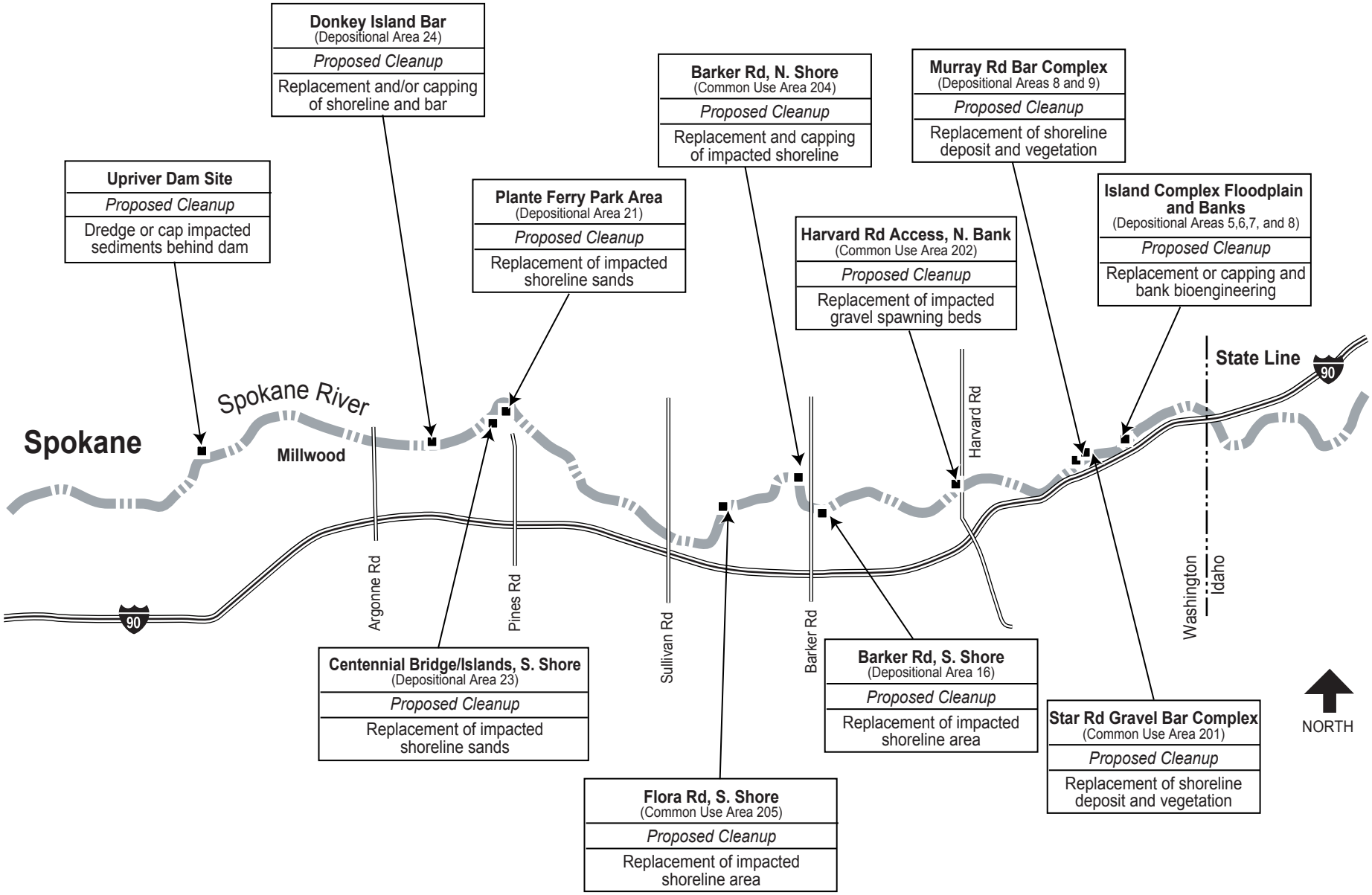

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Figure 8-9

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Spokane River Cleanup Actions

At present, the risks to persons, including Spokane tribal members, who would choose to practice a subsistence lifestyle in the Spokane River area are not fully understood. EPA and the Spokane Tribe are cooperating in planning additional testing and studies to evaluate these exposures.

8.5 MANAGEMENT OF MATERIAL GENERATED BY CLEANUP ACTIVITIES

Implementation of the remedy would require construction of one or more permanent repositories for disposal of metals-contaminated soils, sediments, and source materials. The governments will work with the communities to identify suitable disposal sites and engineering designs. Potential criteria that may be used in this evaluation include:

- Redevelopment and reuse potential
- Community support
- Land owner consent
- Access to roadways and transportation impacts
- Location of material relative to consolidation/fill areas
- Nature of material and cap requirements
- Concentrations of metals at potential consolidation/fill areas
- Proximity to residences and populated areas
- Proximity to streams and waterways
- Proximity to groundwater resources
- Long-term operations and maintenance costs

Exact criteria and potential repository locations will be developed with community input during the remedial design phase, which will occur after the cleanup decisions are made in the ROD.

The estimated volumes of material that may require excavation and disposal during the interim action are about 500,000 to 900,000 cy in the Upper Basin and about 2,600,000 cy in the Lower Basin. By comparison, there are currently about 2,100,000 cy of tailings in the Hecla-Star Tailings Ponds in lower Canyon Creek and about 13,600,000 cy of dredge spoils in the Mission Flats area.

No lakes will be sacrificed as repositories. To reduce the area affected by contaminated materials within wetlands or lakes, contaminated materials already located in a given wetland or lake may be consolidated within the same wetland or lake unit and capped with an engineered, clean, sediment cover. The consolidation would be designed to maintain the full functionality of the wetland or lake. Coeur d'Alene Lake would not be used as a repository.

8.6 BENEFITS OF THE INTERIM ACTION

The proposed interim action identified in this Proposed Plan offers significant benefits for protection of human health and the environment. Although it would not achieve all long-term goals, it makes a significant step toward achieving those goals. Figure 8-10 illustrates the relationship between the interim action and the long-term remedy that, based on current information, EPA believes is needed for full protection of human health and the environment and compliance with ARARs. Some of the specific benefits include:

- Reductions in blood lead levels in children to meet the CDC guidelines of the probability of an individual child having a blood lead level greater than 10 µg/dL being 5 percent or less and of greater than 15 µg/dL being 1 percent or less
- Cleanup of 31 recreational areas in the Lower Basin
- Cleanup of all 10 shoreline sites identified by the State of Washington between the state line and Upriver Dam
- Provide varying levels of fisheries (adult fisheries, areas capable of supporting spawning and rearing) connected with migratory corridors to allow increased movement between the tributaries and the river. This would include re-establishment of fisheries in Ninemile Creek, improvements of spawning and rearing fisheries in Pine Creek, and improvements in the fisheries and water quality in the South Fork and Lower Basin. Figure 8-11 shows the interim benchmarks for improvements in fisheries conditions in the Upper Basin.
- A reduction of about 660 pounds per day of dissolved zinc loads from the Upper Basin and Lower Basin
- An addition of 2,669 acres of safe wetland feeding area in the Lower Basin
- An addition of 1,859 acres of safe lake feeding area in the Lower Basin
- Stabilization of 33 miles of Coeur d'Alene River bank that is a source of particulate lead
- Cleanup of the riparian zone adjacent to 33 miles of river bank in the Lower Basin
- Removal of 1,300,000 cy of river bed sediments from natural depositional areas over the duration of the interim action to reduce downstream lead loading and recontamination

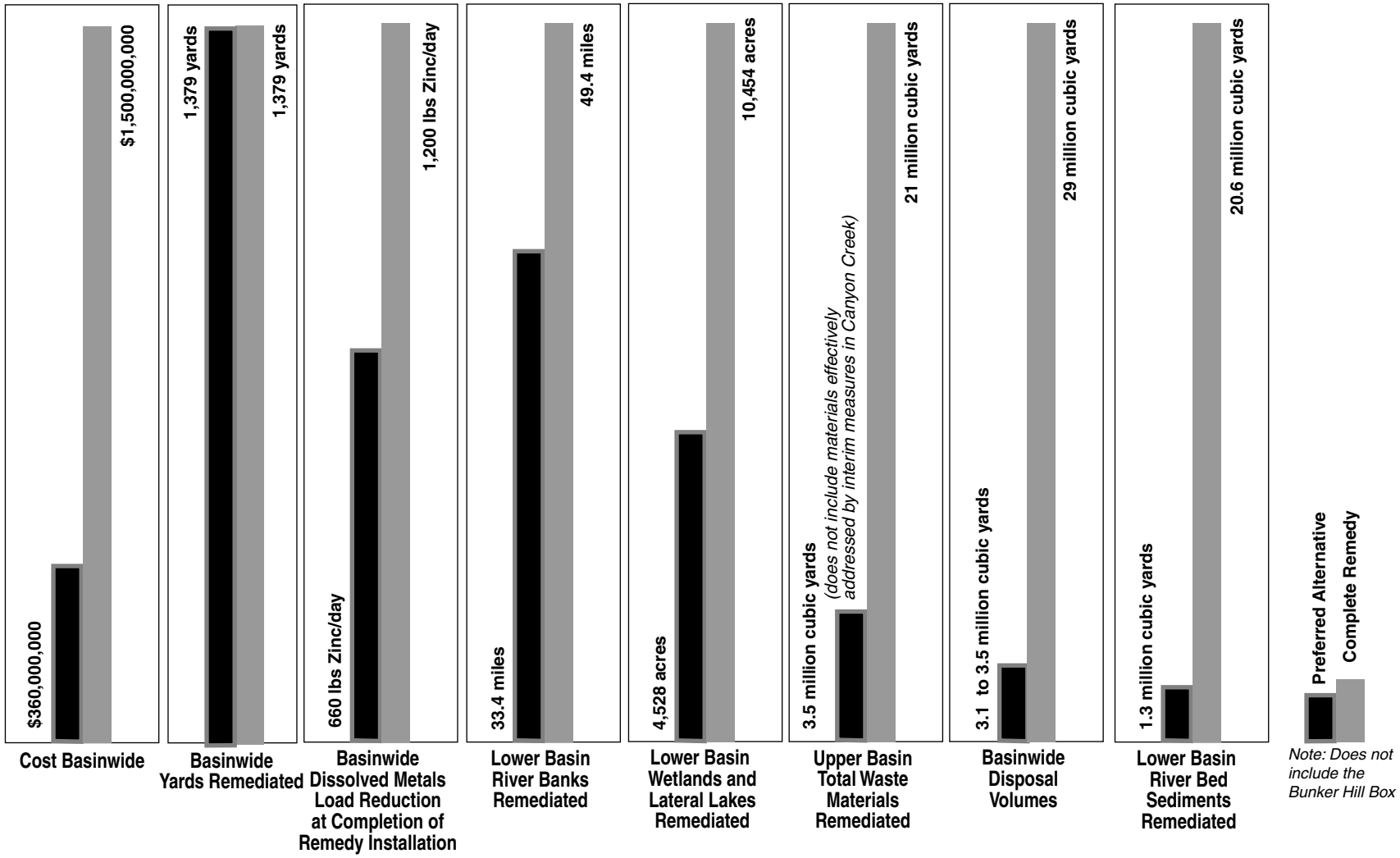

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Figure 8-10

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Comparison of Interim Action to Full Remedy

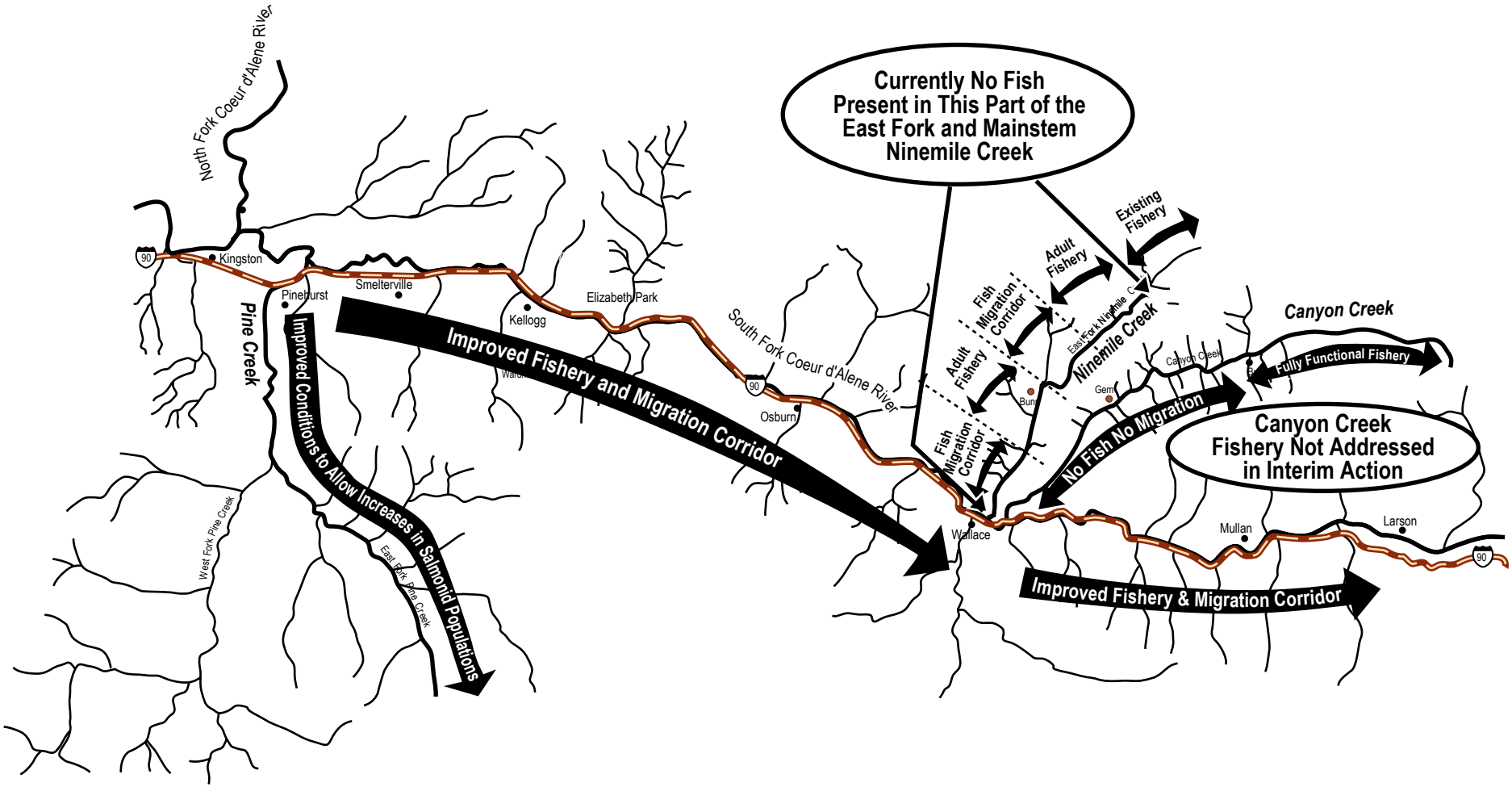

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Figure 8-11

Coeur d'Alene Basin RI/FS
PROPOSED PLAN

Upper Basin Fisheries Status after Implementation of Interim Action

This interim action constitutes EPA's Preferred Alternative. The interim action meets the criteria established in the NCP and EPA guidance for selection of an interim action. EPA's threshold criteria in selecting a final remedy include overall protection of human health and the environment and compliance with ARARs. The interim action includes the full remedy for human health in the communities and residential areas of the Upper and Lower Basin and along the Spokane River upstream of Upriver Dam. It would be protective of human health and comply with human health ARARs in these areas. Although the interim action would not, by itself, be fully protective of the environment and achieve environmental ARARs, it represents what EPA believes is a significant first step toward these goals and the best balance of tradeoffs when evaluated using the CERCLA balancing criteria discussed below. The interim action would comply with those ARARs that are included within the scope of the proposed work. Compliance with location and action-specific ARARs would be achieved as work is completed.

Interim actions that EPA selects should neither be inconsistent with nor preclude implementation of the expected final remedy. Because the interim action for environmental protection includes prioritized Upper Basin and Lower Basin actions derived from FS Ecological Alternative 3, which is the level of cleanup EPA believes necessary to achieve long-term cleanup goals, as well as the full remedy for the Spokane River between the state line and Upriver Dam, it inherently meets this requirement.

EPA's balancing criteria in selecting a remedy include: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The interim action would go a long way towards achieving long-term effectiveness and permanence by beginning to control the sources and reduce ecological exposure in high-use areas. It would achieve substantial reductions in residual risks to aquatic receptors resulting from metals in surface water and to waterfowl and other animals resulting from metals in wetland and lateral lake sediments. Effectiveness and permanence would increase over time with the implementation of subsequent increments. Use of treatment of surface water in the Canyon and Ninemile Creek areas would be consistent with EPA's preference to reduce toxicity, mobility, or volume through treatment.

The interim action would provide short-term effectiveness through prioritizing human health actions and focusing environmental emphasis on dissolved metals in rivers and streams, lead in floodplain soil and sediment, and particulate lead in surface water, while limiting adverse impacts on the communities and ecosystems. As construction is completed at individual sites, RAOs for those soils, sediments, and source materials addressed by the interim action would be achieved. Implementation of the human health remedies is a top priority, and it is anticipated the RAO for blood lead levels in children would be achieved within a relatively short time after completion of remedial actions. The interim action includes sequenced cleanup actions that would be both technically and administratively implementable. Requirements for repository space and relatively scarce materials such as topsoil or growth media would be spread out over

time to enhance implementability. The interim action would be cost effective; it achieves a significant reduction in residual risk relative to its cost.

This preliminary evaluation will be reassessed after the public comment period when state, tribal and community acceptance is evaluated and incorporated into the final remedial decision, which may be a modification of the interim action or another remedy, based on new information or public comments.

9.0 COMMUNITY PARTICIPATION

Community involvement has played an integral part in the process of developing an effective cleanup plan for the Coeur d'Alene Basin. The project area encompasses a large geographic area that includes unique communities with diverse interests and points of view. The area includes parts of two states, four counties, numerous small towns, and several cities.

The Coeur d'Alene Basin is a unique community involvement challenge. Recognizing this, EPA has presented a wide range of opportunities for people in the Basin to learn about and participate in the RI/FS process. Some of the community involvement tools EPA has presented are summarized in Figure 9-1.

Public interest regarding EPA's activities has been very high, and citizens throughout the Basin have been actively involved in providing input. EPA maintained flexibility in its community involvement program by tailoring its efforts to the specific requests and suggestions from groups throughout the Basin. For example, monthly news briefs, open weekly technical conference calls, educational workshops, draft technical documents for public review, support for a science summit and community health festival, support staff provided to the Citizens Advisory Committee RI/FS task force, and executive summaries for technical documents were provided based on community input.

Since February 1999, approximately 170 meetings have occurred in the Basin related to EPA's work in which EPA was the host or a participant. EPA's Regional Administrator has visited the Basin 16 times to discuss critical issues. For a summary of input and consensus and how EPA has acted on the issues, see the Notice of Availability for this Proposed Plan (October 2001). The community has provided input through a number of forums, including:

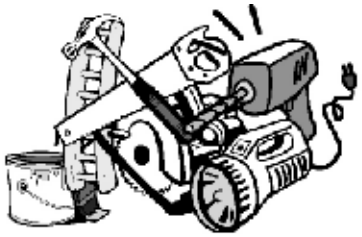
- Community interviews, Spring and Summer 1999
- Community Involvement Plan, late Winter 1998
- Citizens Advisory Committee RI/FS Task Force and Washington Citizens Advisory Committee, formed mid-1999
- Educational workshops for the Human Health and Ecological Risk Assessments and the Feasibility Study, early 2000
- State of Idaho Basin Consensus Process, initiated in Late 2000
- Public review of draft technical documents with detailed written responses including:
    - Draft Human Health Risk Assessment, (July 2000-October 2000)

- Draft Ecological Risk Assessment, (August 2000-November 2000)
- Draft Remedial Investigation, (October 2000-March 2001)
- Draft Feasibility Study, (December 2000-April 2001)

- Proposed Plan Progress Report and public meetings, April 2001 and August 2001

Now that the Proposed Plan has been published, it is important to EPA that the public continues to provide input to the formal decision-making process. Following the comment period on the Proposed Plan, EPA will consider all comments and issue the ROD in early 2002. The selected remedy may be a modification of the interim response action or another remedy, based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives and the cleanup actions presented in the Proposed Plan. The ROD will also include a responsiveness summary, which will contain the responses to the comments received during the Proposed Plan public comment period.

Once the ROD is issued, design and implementation of the cleanup actions will begin. The collaborative process among the agencies, tribes, local governments, and community members will be critical during this next phase. After the ROD is issued, EPA will update the Basin Community Involvement Plan to include opportunities for involvement during the clean up phase of work.



Community Involvement Tool Box

Have a Say in the Long-Term Cleanup Plan for the Basin

Here some of the ways you can both get information and give your input:

Bookmark the Coeur d'Alene Basin Website:
The website has general information, data, technical documents, news clippings, schedule of upcoming meetings and a list of people to contact for more information.
http://yosemite/epa.gov/r10/cleanup.nsf/sites/cda

Attend Regular Meetings of Actively Involved Citizens:

Citizens Advisory Committee RI/FS Task Force: Meets approximately every other month.
Contact: ***Marti Calabretta, chairman, 208-786-2471.***

Washington Citizens Advisory Committee (WCAC): Meets approximately every other month.
Contact: ***Jim Wilson, 509-252-2290.***

Basin Consensus Building Process: This group is professionally facilitated and is open to anyone who would like to participate. The group is focusing on the following specific cleanup related issues: selecting waste repository locations, human health, criteria for contaminated river bank removal and stabilization, cover and capping options (topsoil) and community involvement.
Contact: ***Liz Arnold, 208-753-7537.***

Attend Public Workshops and Meetings: Between now and the time the Record of Decision is issued at the end of the year you will have the opportunity to attend several workshops and public meetings to learn about proposed cleanup work in the Basin. If you would like to be on the mailing list to receive notice of these meetings, call ***Marianne Deppman, at 1-800-424-4372.***

Submit Comments During Comment Period: When the Proposed Plan is released later this year, there will be a formal public comment period. Draft technical documents When major documents are released.

Read Monthly Newsbriefs: This publication contains the most current list of the activities of the agencies and groups doing work in the Basin and lists upcoming meetings of interest. Contact: ***Marianne Deppman, 1-800-424-4372, to get on the mailing list.***

Visit the Basin Information Repositories: Local libraries that have technical documents and other information related to the Basin.

Harrison City Hall (208-689-3212) North Idaho College Library (208-769-3355)
Spokane Public Library (downtown - 509-626-5336)
Wallace Public Library (208-752-4571) EPA's Coeur d'Alene Field Office (208-664-4588)

Apply for a Technical Assistance Grant (TAG): A TAG is available to help people in the Basin understand site-related technical information and participate in cleanup decisions. To find out if your group eligible for a TAG and other information, visit the website: **http://www.epa.gov/superfund/tools/tag/index.htm**, or call ***Jeanne O'dell, at EPA in Seattle, 1-800-424-4372.***

Call or Meet With our Coeur d'Alene Based Staff: ***Call Dick Martindale, 208-664-4588***

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Figure 9-1

10.0 ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
BHSS	Bunker Hill Superfund Site
BLM	Bureau of Land Management
CDC	Center for Disease Control and Prevention
CDR	Coeur d'Alene River
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIA	central impoundment area
CSM	conceptual site model
cy	cubic yard
Eco RA	ecological risk assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FS	feasibility study
HEPA	high efficiency particulate air
HHRA	human health risk assessment
IDEQ	Idaho Division of Environmental Quality
IEUBK	integrated exposure uptake biokinetic model
the Lake	the Coeur d'Alene Lake
lb/d	pound per day
LOAEL	lowest observed adverse effects level
MBTA	Migratory Bird Treaty Act
MCL	maximum containment level
µg/dL	microgram per deciliter
mg/kg	milligram per kilogram
NCP	National Oil and Hazardous Substances Contingency Plan
NPDES	national pollution discharge elimination system
O&M	operations and maintenance
OSWER	Office of Solid Waste and Emergency Response
the Plan	The Coeur d'Alene Basin Proposed Plan
PHD	Public Health District
ppm	part per million
RA	remedial action
RAO	remedial action objective
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	record of decision
SFCDR	South Fork Coeur d'Alene River
UPRR	Union Pacific Railroad

SVNRT	Silver Valley National Resource Trustees
USFWS	U.S. Fish and Wildlife Service

11.0 GLOSSARY

Active water treatment A treatment system that typically requires frequent or continuous operator attention and addition of treatment chemicals. Typically most appropriate for sites with good access and water with relatively high concentrations of metals.

ambient water quality criteria (AWQC) Federal regulatory criteria defining acceptable levels of contaminants in surface water for protection of aquatic life. Two categories of AWQC are typically defined: acute and chronic. Acute criteria refer to concentration thresholds that are acceptable for short exposure durations (e.g., 24 hours), while chronic criteria refer to concentration thresholds acceptable for longer term exposures (e.g., days, weeks). In the case of metals, AWQC vary with water hardness to account for increased toxicity at lower hardness levels.

anadromous Fish that spend their adult life in the sea but swim upriver to freshwater spawning grounds to reproduce.

apatite A phosphate mineral with a high capacity to absorb lead and other metals. Fish bone material containing apatite is being used at the Success mine site to remove metals from groundwater. Apatite is also being evaluated for use as an amendment to reduce the bioavailability of lead in soil in the Basin.

applicable or relevant and appropriate requirements (ARAR) Those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that either (1) specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA (i.e., applicable standards), or (2) while not "applicable", address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site (i.e., relevant and appropriate standards). Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

bioavailability The extent to which the form of a chemical occurring in a medium is susceptible to being taken up by an organism. A chemical is said to be bioavailable if it is in a form that is readily taken up (e.g., dissolved organic matter).

bioengineering The process of rehabilitating degraded riverine and riparian habitats using natural materials such as logs, boulders, and live vegetation. These materials are employed using a design strategy which complements natural physical and biological processes.

Bunker Hill Box A 3 mile by 7 mile rectangular area adjacent to the lower South Fork of the Coeur d'Alene River. The Bunker Hill Box was the location of the lead smelter and other processing facilities, and is the current location of the central impoundment area (CIA) and the

central treatment plant (CTP). As defined in the record of decision, the Bunker Hill Box does not include the portion of the South Fork that runs through it. Although a part of the Basin, the Bunker Hill Box is not included in this Proposed Plan.

Central Treatment Plant (CTP) An active water treatment plant in Kellogg that currently treats acid mine drainage from the Kellogg Tunnel.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) The 1980 federal law that authorized response actions for uncontrolled releases of hazardous substances to the environment (42 USC Section 9601 et seq.). CERCLA is commonly known as Superfund. The law was modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA).

Endangered Species Act (ESA) (16 U.S.C. §§1531-1544) The ESA, passed by Congress in 1973, is a far-reaching federal law which provides for the protection of imperiled plant and animal species and their habitats. Among many other requirements, the ESA compels federal agencies to ensure that any federally implemented or funded actions will not further imperil or impede the recovery of species listed for protection under the act.

hydraulic isolation the implementation of methods to control the movement of contaminated groundwater, including methods to prevent the discharge of contaminated groundwater into the river system.

Integrated Exposure Uptake Biokinetic (IEUBK) Model The IEUBK Model is a computer model used to predict blood-lead concentrations for children exposed to lead in their environment. The model allows the user to input relevant absorption parameters, (e.g., the fraction of lead absorbed from water) as well as rates for intake and exposure. Using these inputs, the IEUBK model then calculates and recalculates a complex set of equations to estimate the potential concentration of lead in the blood for a hypothetical child or population of children (6 months to 7 years). The IEUBK model calculates the probability that children's blood-lead concentrations will exceed 10 micrograms of lead per deciliter, the concentration at or above which presents risks to children's health.

interim benchmark Near-term goals that serve as landmarks and measurements to evaluate the progress of the remedy toward achievement of the long-term cleanup goals for the Basin.

lowest observed adverse effects level (LOAEL) The lowest level of exposure to a chemical in a test that causes a statistically significant frequency of toxic effects in an animal or plant.

Maximum Contaminant Level (MCL) The maximum permissible level of a contaminant in water delivered to any user of a public system. MCLs are enforceable standards.

Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§703-712) The MBTA, passed by Congress in 1918, prohibits the taking of certain migratory bird species protected by international convention.

National Oil and Hazardous Substances Contingency Plan (NCP) The federal regulation that guides determination of the sites to be corrected under both the Superfund program and the program to prevent or control spills into surface waters or elsewhere.

passive water treatment A treatment system that is designed to function for extended periods of time with minimal operator attention or addition of treatment chemicals. Typically most appropriate for remote sites and/or water with relatively low concentrations of metals.

Record of Decision (ROD) A public document that presents the selected remedy for cleanup of a site under Superfund.

Remedial Investigation/Feasibility Study (RI/FS) An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a site; establish criteria for cleaning up the site; identify preliminary alternatives for remedial actions; and support the technical and cost analyses of the alternatives. The remedial investigation is usually done with the feasibility study. Together they are usually referred to as the "RI/FS."

riparian Occurring in or by the edge of a stream (including its floodplain).

salmonid A family of fish species which includes salmon, trout, and whitefish.

Upper Basin and Lower Basin The Upper Basin is the basin of the South Fork of the Coeur d'Alene River Basin above its confluence with the North Fork. The Lower Basin is the Coeur d'Alene River Basin from the confluence of the South Fork and North Fork downstream to where the river discharges into Coeur d'Alene Lake at Harrison. For this Proposed Plan, the Upper Basin does not include the Bunker Hill Box.

young of the year (YOY) An animal or fish less than one year old.

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