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COEUR D'ALENE BASIN

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NATIONAL REMEDY REVIEW BOARD PRESENTATION INFORMATION
COEUR D'ALENE BASIN REMEDIAL INVESTIGATION/FEASIBILITY STUDY

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EXECUTIVE SUMMARY

Site Summary

The Coeur d'Alene Basin is located in northern Idaho and northeastern Washington and consists of the South Fork of the Coeur d'Alene River (the "Upper Basin"); the lower Coeur d'Alene River (the "Lower Basin"); Coeur d'Alene Lake; and the Spokane River. The site has been assigned CERCLIS identification number ID048340921.

Most of the site is undeveloped and includes large areas of federal and state land. Developed land uses include residential, recreational, agricultural, and light urbanization or industrialization. Human habitation is primarily concentrated in communities along the South Fork Coeur d'Alene River (South Fork) and population centers in the cities of Coeur d'Alene and Post Falls, Idaho, and Spokane, Washington. The Basin is the ancestral home of the Coeur d'Alene Tribe with Tribal lands present in the Lower Basin. The Spokane Tribal lands are present along the lower Spokane River in the state of Washington.

Within the site, historic mining practices, beginning in the late 1880s, have resulted in widespread contamination. The contamination threatens both human health and the environment. The site contaminants are primarily metals, and the metals considered of principal concern include lead and arsenic for protection of human health, and lead, cadmium, and zinc for protection of ecological receptors. The affected media are soil, sediment, surface water, and groundwater.

Until 1968, most tailings were discharged directly into the South Fork or its tributaries. 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/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Upper and Lower Basin 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 impacted materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres. Leaching and erosion of tailings-impacted sediments is the primary source of metals in surface water. Direct exposure to metals in sediments is a source of risk for human and ecological receptors, including recreational users, subsistence users, migrating waterfowl, and plants.

Four operable units (OUs) have been identified in the National Priority List (NPL) site. OUs 1, 2, and 3 are located within the Bunker Hill Superfund Site (BHSS), a 21-square-mile rectangular area that spans the lower South Fork. The BHSS was the site of some of the most highly-impacted materials within the Basin. The OUs are described as follows:

- **OU 1: Populated areas of the BHSS.** A Record of Decision (ROD) for OU 1 was signed in 1991, and remedial activities have been conducted since 1994. Completion of remedy implementation is anticipated in 2003.

- **OU 2: Non-populated areas of the BHSS.** A ROD for OU 2 was signed in 1992. Phase I remedial actions are largely aimed at consolidating the most extensive contamination from various areas of the site, and are estimated to be mostly complete in 2001. Phase II will address surface water and groundwater cleanup.

- **OU 3: Central Treatment Plant (CTP).** The CTP is an active water treatment facility that treats acid mine drainage from the Bunker Hill mine. The CTP has been in operation since 1974, and in 1998, a remedial investigation/feasibility study was initiated to address upgrading the treatment plant to meet total maximum daily load (TMDL) discharge requirements.

- **OU 4:** All areas of the Basin outside of the BHSS where mining-related contamination is located. OU 4 extends from near the Idaho-Montana border into the state of Washington, and includes floodplains, communities, lakes, rivers, and tributaries.

Risk Summary

The primary human health concern in the Basin is lead in the blood of children and pregnant women. Blood lead surveys have noted excessive levels of blood lead in children, with only minor problems among adults. Site-specific analysis of blood lead data paired with environmental lead data suggests complex exposure pathways. Blood lead levels appear to be most closely related to lead in house dust, followed by independent effects of lead in yard soil, the condition of interior lead-based paint, and the lead content of exterior paint (TerraGraphics and URSG 2000). High blood lead levels in the Lower Basin have been associated with homes that were flooded in 1996, and recreational activities outside the home (TerraGraphics and URSG 2000).

Individuals who practice a subsistence lifestyle would face substantially higher risks resulting from consuming large amounts of fish and native vegetables, higher exposure to soil and sediment, and potential ingestion of untreated surface water. Current levels of contamination preclude subsistence use of these resources by the tribes and other potential users. Current health advisories related to recreational activities include fish consumption advisories and warning signage at beaches and swimming areas in the Lower Basin and the Spokane River.

Most watersheds in which mining has occurred and a large portion of the Basin downgradient of mining areas are ecologically degraded. Some of the more severe and visible impacts include:

- Approximately 20 miles of the South Fork and 10 miles of tributaries are unable to sustain reproducing fish populations. Species density and diversity are reduced throughout the Basin. 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). The ambient water quality criteria for zinc and cadmium are exceeded throughout the Coeur d'Alene River system downstream of mining impacts, in Coeur d'Alene Lake, and in the Spokane River.

- Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. The total number of waterfowl dying of lead poisoning has not been estimated; however, 682 dead or sick birds were found in the Basin between 1992 and 1997. 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 at reference sites nationally.

- Concentrations of metals in riparian soils along the Coeur d'Alene River, the South Fork, and its tributaries are sufficiently high to be toxic to vegetation.

The ecological risk assessment concluded that high concentrations of metals are pervasive in the soil, sediment, and surface water, where they pose substantial risks to plants and animals that inhabit the Basin. Cadmium, lead, and zinc pose the greatest risk to ecological receptors. Few species had no identifiable risks. Unacceptable risks were identified for all receptor classes.

Numerous species 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 U.S. Fish and Wildlife Service as species of concern, state-listed sensitive plant species, and culturally significant plant species. Examples include the bull trout, westslope cutthroat trout, bald eagle, black tern, gray wolf, lynx, spotted frog, Ute ladies'-tresses, and water potato.

Remediation Goals

Remediation goals for protection of human health are focused on targets established by the U.S. Environmental Protection Agency (EPA) for children's blood lead levels:

> *Prevent the exposure of humans to lead in soil and other media such that there is a 95% or greater probability that a child or children ages 0 to 84 months have blood lead levels less than 10 µg/dL, and a 1% or lower probability that a child or children ages 0 to 84 months have blood lead levels greater than 15 µg/dL.*

Remediation goals for ecological protection are focused on compliance with applicable or relevant and appropriate requirements (ARARs) for surface water quality and preventing exposures of ecological receptors to metals in soil and sediment at concentrations that result in toxic effects. Attaining water quality standards will provide for the protection and propagation of fish and wildlife and for recreation in and on the surface waters and take into consideration the use and value of the waters in the Coeur d'Alene Basin. However, given the extent of contamination in the Basin, it is expected that either a tremendous amount of capital expenditures or an extended period of time will be required to achieve full ecological protection.

As part of the preferred alternative implementation for ecological protection, EPA is evaluating an incremental approach to remediation. This involves phasing the cleanup over an extended period, which could result in a significant cost savings compared to a lump sum full funding. To illustrate this, a 7% discount on a $1 billion remedy implemented over a 50-year time period in equal 5-year increments would result in an approximately $670 million savings in capital costs. This phased approach also allows greater efficiencies, because observations of the effectiveness of selected remediation technologies can be assessed and subsequent phases adapted to maximize the cleanup results. As part of the public comment process, we will solicit input on the appropriate set of interim benchmarks, which are near-term goals that would serve as landmarks to measure the progress of the remedy toward achievement of the long-term remediation goals. Given that full implementation of the preferred alternative for ecological protection is necessary to achieve protectiveness and that we hope to pursue an "observational" or "adaptive management" approach, the interim benchmarks we are considering are:

- Achieve sufficient water quality to sustain fish in selected watersheds or segments of the Upper Basin
- Reduce waterfowl mortality in the lower Basin
- Reduce transport of particulate lead, which impacts both ecological and human health to floodplains, Coeur d'Alene Lake, and the Spokane River

Description of Alternatives

Alternatives were developed for protection of human health in the communities and at common use areas (the human health alternatives) and for protection of ecological receptors (the ecological alternatives); protection of ecological receptors also overlaps with components of human health protection in recreational areas with beaches and floodplain sediments, waste piles, and abandoned mill sites.

The human health alternatives were developed by medium. Alternatives were developed for soil, drinking water, house dust, and fish consumption. The human health alternatives are summarized in Table ES-1, with the preferred alternative highlighted.

The ecological alternatives were developed by geographical area. Alternatives were developed for the Coeur d'Alene River Basin (including the Upper Basin and Lower Basin), Coeur d'Alene Lake, and the Spokane River. Reflecting a comprehensive approach, the ecological alternatives were assembled to deal with both "local" site-specific effects and "global" site-wide effects. The ecological alternatives are also summarized in Table ES-1.

Preferred Alternative

Although the details of the phasing of the preferred alternative are still under development for ecological cleanup, remedies for protection of human health would be implemented as a first priority. Information from the implementation of the remedy in the BHSS was used to evaluate the range of cleanup alternatives. Based on this evaluation, the governments (which include the States of Idaho and Washington, and the Coeur d'Alene and Spokane Tribes) have general agreement on the proposed remedy for protection of human health in the communities of the Upper Basin. The governments are continuing discussions to identify appropriate solutions to resolve human health issues in the Lower Basin.

The preferred alternative for human health is based on the following alternatives developed for the feasibility study (FS):

- **Soil:** Alternative S4—Information and Intervention and Partial Removal and Barriers
- **Drinking Water:** Alternative W6—Public Information and Multiple Alternative Sources

- **House Dust:** Alternative D3—Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and contingent Capping/More Extensive Cleaning

- **Fish Consumption:** Alternative F2—Information and Intervention

In comparison to human health, it is a more difficult task to implement a comprehensive remedy for the protection of ecological life in the Basin. The FS showed that the long-term goals, such as meeting surface water quality standards for protection of aquatic life, would be difficult to achieve throughout the Basin given the extent of contamination. Therefore, the comprehensive alternatives presented in the FS are aggressive, some requiring a long time to implement at a significant cost. For the Upper Basin, these alternatives are a "roll-up" of selected technologies applied at the individual source level to effect remediation in the stream segment. The additive effects of the individual sources in the segments in turn improve the ecological health of the watershed which in turn improves the subbasin (referred to as a conceptual site model or CSM in the FS). The cumulative effect of source, segment, and watershed cleanups, therefore, eventually achieves the remedial action objectives for the entire Basin. Given the source-specific approach to remedial alternative selection, the alternatives include assumptions of source contribution and the effectiveness of remedial actions for stream segments and watersheds that are not fully understood at the Basin level. However, Alternative 3 for CSM Units 1, 2, and 3, Alternative 2 for CSM Unit 4, and Alternative 4 for CSM Unit 5 are the most cost effective alternatives, based on the FS evaluation of the comprehensive ecological remedies.

Given the costs involved and the amount of uncertainty, an incremental approach that uses the information available and learns from experience, is the preferred approach to implementing the preferred alternative. A number of benefits could be realized by using an incremental approach to remedy implementation:

- Remedies for protection of human health would be implemented in the communities as a first priority.

- Tangible, observable results could be achieved within a relatively short time in the areas addressed in the initial phase.

- The results of the phased remedy implementation would be monitored to improve the effectiveness of subsequent remedial activities.

- Opportunities would exist for innovative, more cost-effective technologies to evolve over time.

- The cost impacts would be significantly moderated.

Three priority issues have been identified as an initial primary focus with respect to ecological protection.

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams.** These metals have harmful effects on aquatic receptors, including fish, as described in the "Risk Summary."

- **Lead in wetlands and floodplains.** Existing lead contamination has harmful effects on waterfowl and plants, as described in Section 6, Summary of Risks.

- **Particulate lead in the surface water.** Lead transported downstream in the river system is a continuing source of contamination to 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 warning signs at beaches and swimming areas. During flood events, lead transported by the river also impacts the wetlands and floodplains. Implementation of the ecological remedies would also have important human health benefits, including additional protection for recreational users and sensitive populations and protection of future subsistence lifestyles. The human health exposure pathways addressed by the ecological remedies include ingestion of 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.

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

Focus	Medium/Area	Alternative Designation	Description	Estimated Capital Cost	Annual O&M[a]	Estimated Net Present Value Total Cost[b]
Human Health Protection	Soil	S1	No Action	$0	$0	$0
		S2	Information and Intervention	$4,170,000	$150,000	$6,070,000
		S3	Information and Intervention and Access Modifications	$2,200,000	$56,000	$2,900,000
		S4	***Information and Intervention and Partial Removal and Barriers***	***$84,500,000***	***$200,000***	***$87,000,000***
		S5	Information and Intervention and Complete Removal	$126,000,000	$160,000	$128,000,000
	Drinking Water (Interim Measures)	W1	No Action	$0	$0	$0
		W2	Public Information	$0	$35,000	$428,000
		W3	Public Information and Residential Treatment	$470,000	$77,000	$1,428,000
		W4	Public Information and Alternative Source, Public Water Utility	$10,370,000	$35,000	$10,800,000
		W5	Public Information and Alternative Source, Groundwater	$2,313,000	$47,000	$2,900,000
		W6	***Public Information and Multiple Alternative Sources***	***$1,675,000***	***$43,000***	***$2,210,000***
	House Dust	D1	No Action	$0	$0	$0
		D2	Information and Intervention and Vacuum Loan Program/Dust Mats	$349,000	$83,000	$1,380,000
		D3	***Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Contingent Capping/More Extensive Cleaning***	***$3,109,000***	***$83,000***	***$4,140,000***
	Aquatic Food Sources	F1	No Action	$0	$0	$0
		F2	Information and Intervention	$0	$19,000	$230,000
		F3	***Information and Intervention and Monitoring***	***$0***	***$75,000***	***$929,000***

Table ES-1 (continued)
Summary of Alternatives Developed for the Coeur d'Alene Basin

Focus	Medium/Area	Alternative Designation	Description	Estimated Capital Cost	Annual O & M[a]	Estimated Net Present Value Total Cost[b]
Ecological Protection	Coeur d'Alene Basin (including Upper Basin and Lower Basin)	1	No Action			$0
		2	Contain/Stabilize with Limited Removal and Treatment			
			- Upper South Fork	$38,000,000	$350,000	$42,000,000
			- Canyon Creek	$49,000,000	$970,000	$61,000,000
			- Ninemile	$22,000,000	$250,000	$25,000,000
			- Big Creek	$10,500,000	$97,000	$12,000,000
			- Moon Creek	$2,600,000	$33,000	$3,000,000
			- Pine Creek	$21,000,000	$180,000	$23,000,000
			- South Fork	$78,000,000	$550,000	$85,000,000
			- Lower Basin	$99,000,000	$1,100,000	$120,000,000
			Total	$320,000,000	$3,500,000	$370,000,000
		3	***More Extensive Removal, Disposal, and Treatment***			
			- Upper South Fork	$83,000,000	$730,000	$92,000,000
			- Canyon Creek	$150,000,000	$6,900,000	$230,000,000
			- Ninemile	$53,000,000	$470,000	$59,000,000
			- Big Creek	$27,000,000	$220,000	$30,000,000
			- Moon Creek	$3,000,000	$41,000	$3,600,000
			- Pine Creek	$38,000,000	$310,000	$42,000,000
			- South Fork	$170,000,000	$2,300,000	$200,000,000
			- Lower Basin	$630,000,000	$3,400,000	$650,000,000
			Total	***$1,200,000,000***	***$14,000,000***	***$1,300,000,000***
		4	Maximum Removal, Disposal, and Treatment			
			- Upper South Fork	$150,000,000	$1,500,000	$170,000,000
			- Canyon Creek	$180,000,000	$2,300,000	$210,000,000
			- Ninemile	$75,000,000	$580,000	$82,000,000
			- Big Creek	$46,000,000	$240,000	$49,000,000
			- Moon Creek	$3,700,000	$35,000	$4,100,000
			- Pine Creek	$67,000,000	$260,000	$70,000,000
			- South Fork	$210,000,000	$2,300,000	$240,000,000
			- Lower Basin	$1,600,000,000	$7,800,000	$1,700,000,000
			Total	$2,300,000,000	$15,000,000	$2,500,000,000

Table ES-1 (continued)
Summary of Alternatives Developed for the Coeur d'Alene Basin

Focus	Medium/Area	Alternative Designation	Description	Estimated Capital Cost	Annual O & M[a]	Estimated Net Present Value Total Cost[b]
Ecological Protection (Con't)	Coeur d'Alene Basin (including Upper Basin and Lower Basin)	5	State of Idaho Cleanup Plan			
			- Upper South Fork	$8,500,000	$120,000	$10,000,000
			- Canyon Creek	$25,300,000	$600,000	$32,000,000
			- Ninemile	$2,000,000	$43,000	$2,500,000
			- Big Creek	$0	$0	$0
			- Moon Creek	$0	$0	$0
			- Pine Creek	$6,200,000	$110,000	$7,500,000
			- South Fork	$35,000,000	$230,000	$38,000,000
			- Lower Basin	$150,000,000	$900,000	$170,000,000
			Total	$230,000,000	$2,000,000	$257,000,000
		6	Mining Companies Cleanup Plan			
			- Upper South Fork	$16,000,000	$110,000	$18,000,000
			- Canyon Creek	$58,000,000	$790,000	$68,000,000
			- Ninemile	$24,000,000	$180,000	$26,000,000
			- Big Creek	$10,000,000	$68,000	$11,000,000
			- Moon Creek	$320,000	$2,100	$350,000
			- Pine Creek	$12,000,000	$100,000	$13,000,000
			- South Fork	$16,000,000	$120,000	$18,000,000
			- Lower Basin	$34,000,000	$330,000	$40,000,000
			Total	$170,000,000	$1,700,000	$194,000,000
	Coeur d'Alene Lake	1	No Action			$0
		2	***Institutional Controls***	***$8,200,000***	***$130,000***	***$9,900,00***
	Spokane River	1	No Action			$0
		2	Institutional Controls	$6,400	$34,000	$428,000
		3	Containment with Limited Removal and Disposal	$920,000	$37,000	$1,400,000
		4	***More Extensive Removal, Disposal, and Treatment***	***$5,200,000***	***$68,000***	***$6,000,000***
		5	Maximum Removal and Disposal	$26,000,000	$66,000	$27,000,000

a Average annual cost of O&M over 30-year period. Actual O&M costs will vary from year to year.
b Net present value including 30 years of O&M discounted at 7%. Capital costs are not discounted.
Bold Italics = Preferred alternative

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1.0 SITE LOCATION AND DESCRIPTION

For the purposes of the RI/FS, the Coeur d'Alene Basin includes the Coeur d'Alene River and associated tributaries, Coeur d'Alene Lake, and the Spokane River downstream to the Washington State Highway 25 bridge at Fort Spokane on the Spokane Arm of Lake Roosevelt.[1]

The site has been assigned CERCLIS identification number ID048340921. Figures 1.0-1 through 1.0-6 present a map of the greater than 160-river-mile-long site. For purposes of the remedial investigation and feasibility study, the Basin has been divided into five conceptual site models (CSMs). CSMs 1 and 2 represent the Upper Basin, which is the source for most of the mining-related waste materials. It includes the Canyon Creek, Ninemile Creek, Big Creek, Moon Creek and Pine Creek watersheds. These in turn are divided into segments, which are themselves composed of source areas. There are approximately 1,100 separate source areas in the Basin. CSM 3 is the Lower Basin, which includes the Coeur d'Alene River, adjacent lateral lakes, floodplain, and associated wetlands. CSM 4 is Coeur d'Alene Lake, and CSM 5 is the depositional areas and continuing secondary sources on the Spokane River, which flows from Coeur d'Alene Lake.

Within the Basin, historic mining practices, beginning in the late 1880s, have resulted in widespread contamination. The contamination threatens both human health and the environment. The site contaminants are primarily metals, and the metals considered of principal concern include lead and arsenic for protection of human health, and lead, cadmium, and zinc for protection of ecological receptors.

The site contains the Bunker Hill Superfund Site (BHSS), a 21-square-mile rectangular area that spans the lower South Fork of the Coeur d'Alene River (South Fork). The BHSS was the site of the most intensive mining activities, and was the location of some of the most highly-impacted materials within the Basin. The BHSS is the subject of two existing Records of Decision (RODs), one for populated areas (signed in 1991) and one for non-populated areas (signed in 1992). Removal actions were initiated in 1986, and remedial activities have been ongoing since 1994.

[1] Coeur d'Alene Lake and the upstream watershed were originally the extent of the study area, but the Spokane River was subsequently added without a change in the project name.

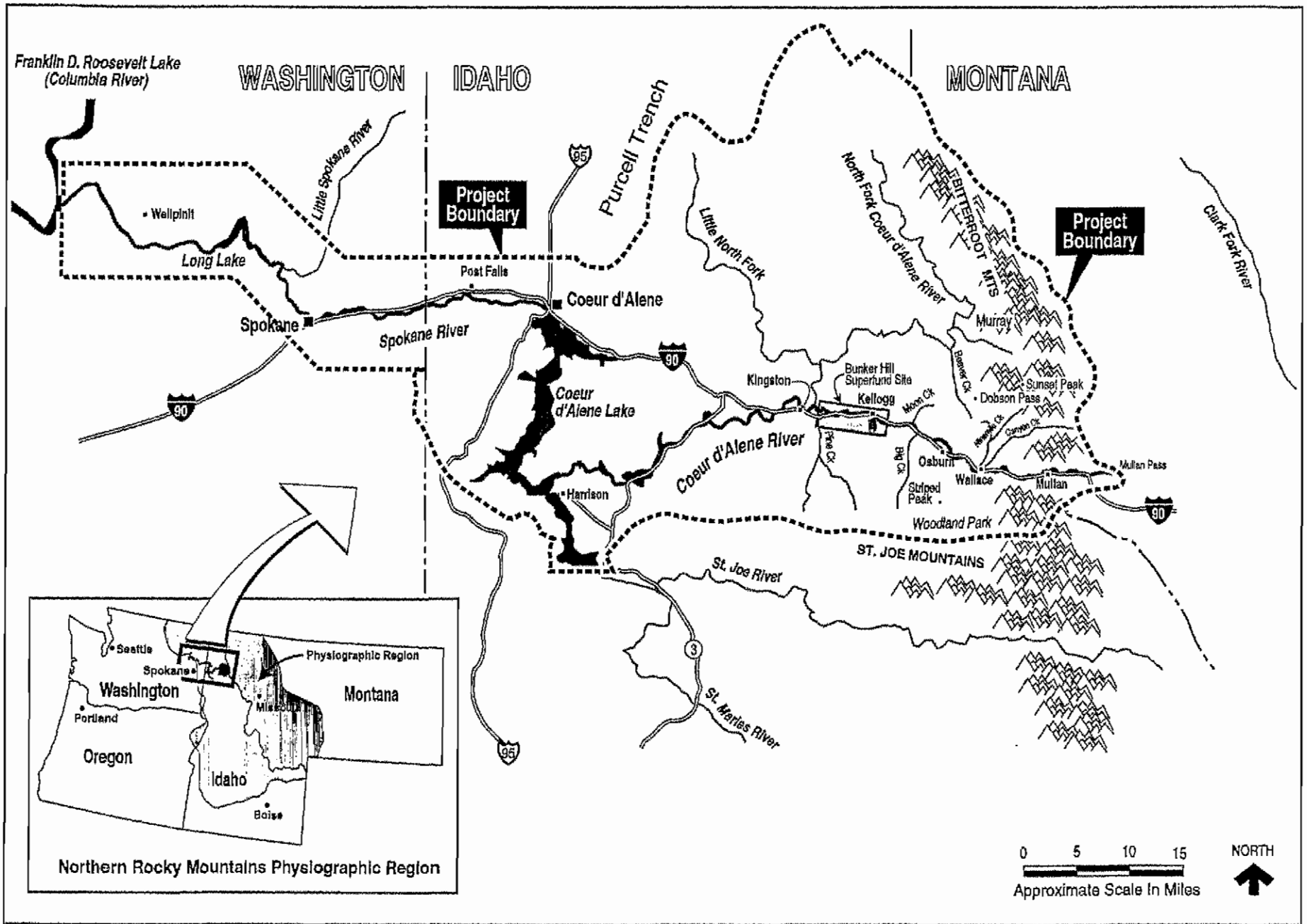

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Figure 1.0-1
Project Location Map

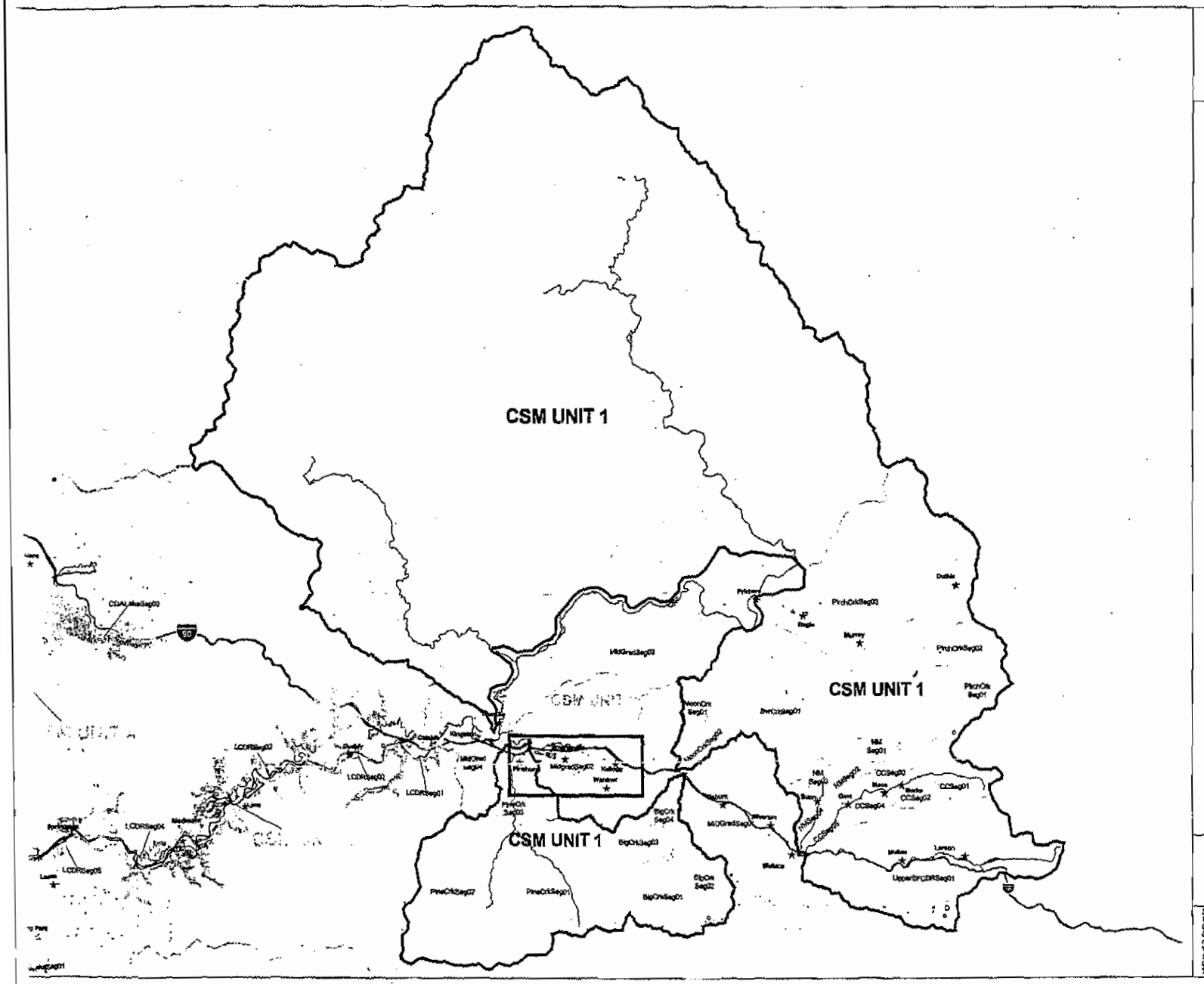
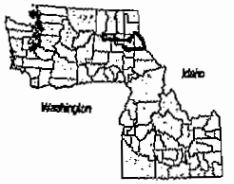


Figure 1.0-2
CSM Unit 1
Segment Boundaries

LEGEND

- City
- CSM Unit
- Bunker Hill Site Boundary
- Interstate 90
- Lakes and Rivers
- Segment Boundary



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 300,000

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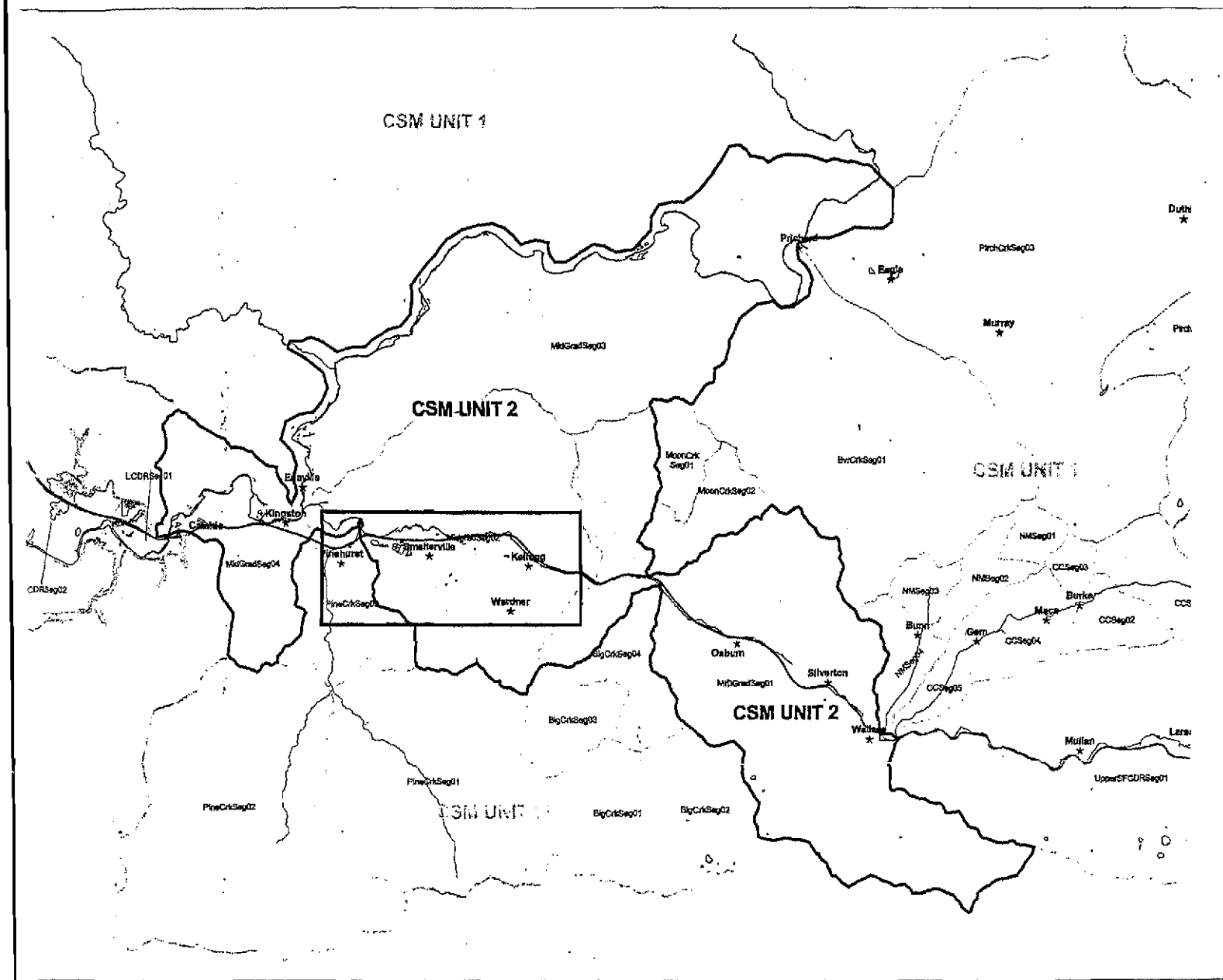
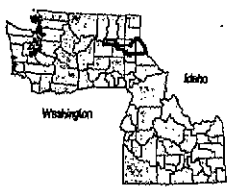


Figure 1.0-3
CSM Unit 2
Segment Boundaries

LEGEND

- City
- CSM Unit
- Bunker Hill Site Boundary
- Interstate 90
- Lakes and Rivers
- Segment Boundary



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 160,000

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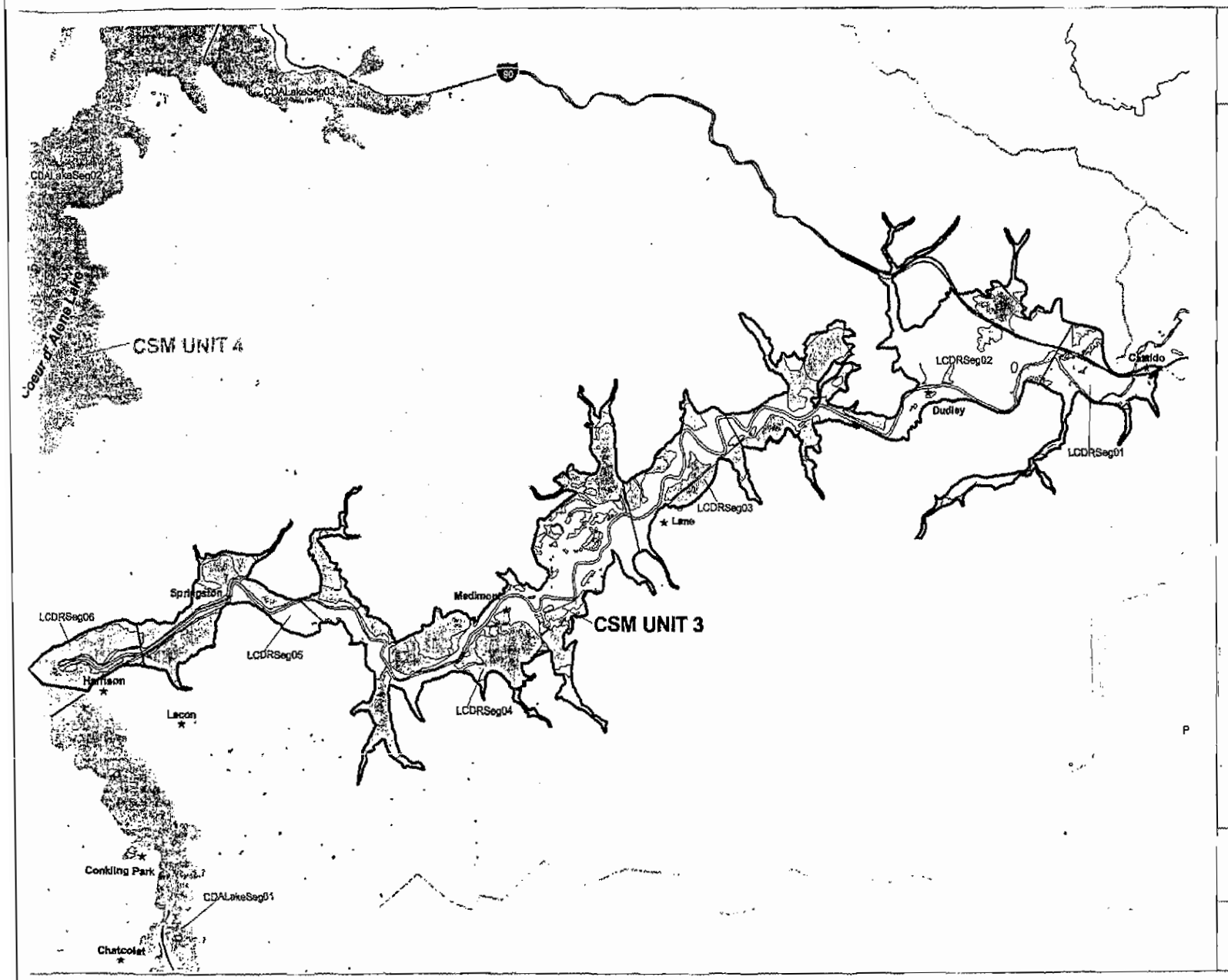

Figure 1.0-4
CSM Unit 3
Segment Boundaries

LEGEND

- City
- CSM Unit
- Interstate 90
- Lakes and Rivers
- Segment Boundary

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 120,000

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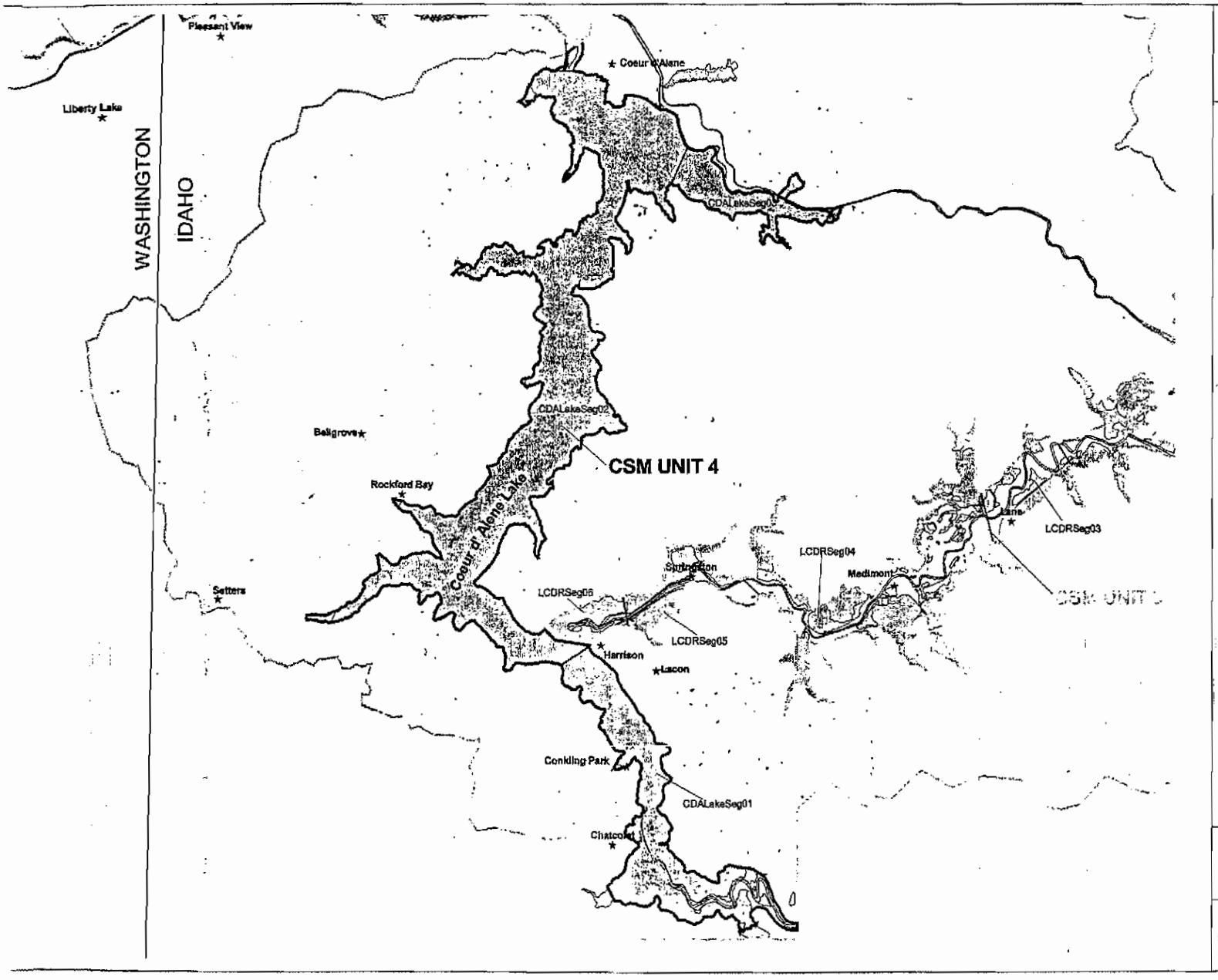
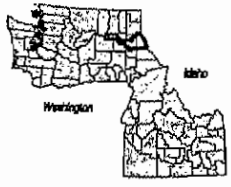


Figure 1.0-5
CSM Unit 4
Segment Boundaries

LEGEND

- City
- CSM Unit
- Interstate 90
- Lakes and Rivers
- Segment Boundary



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

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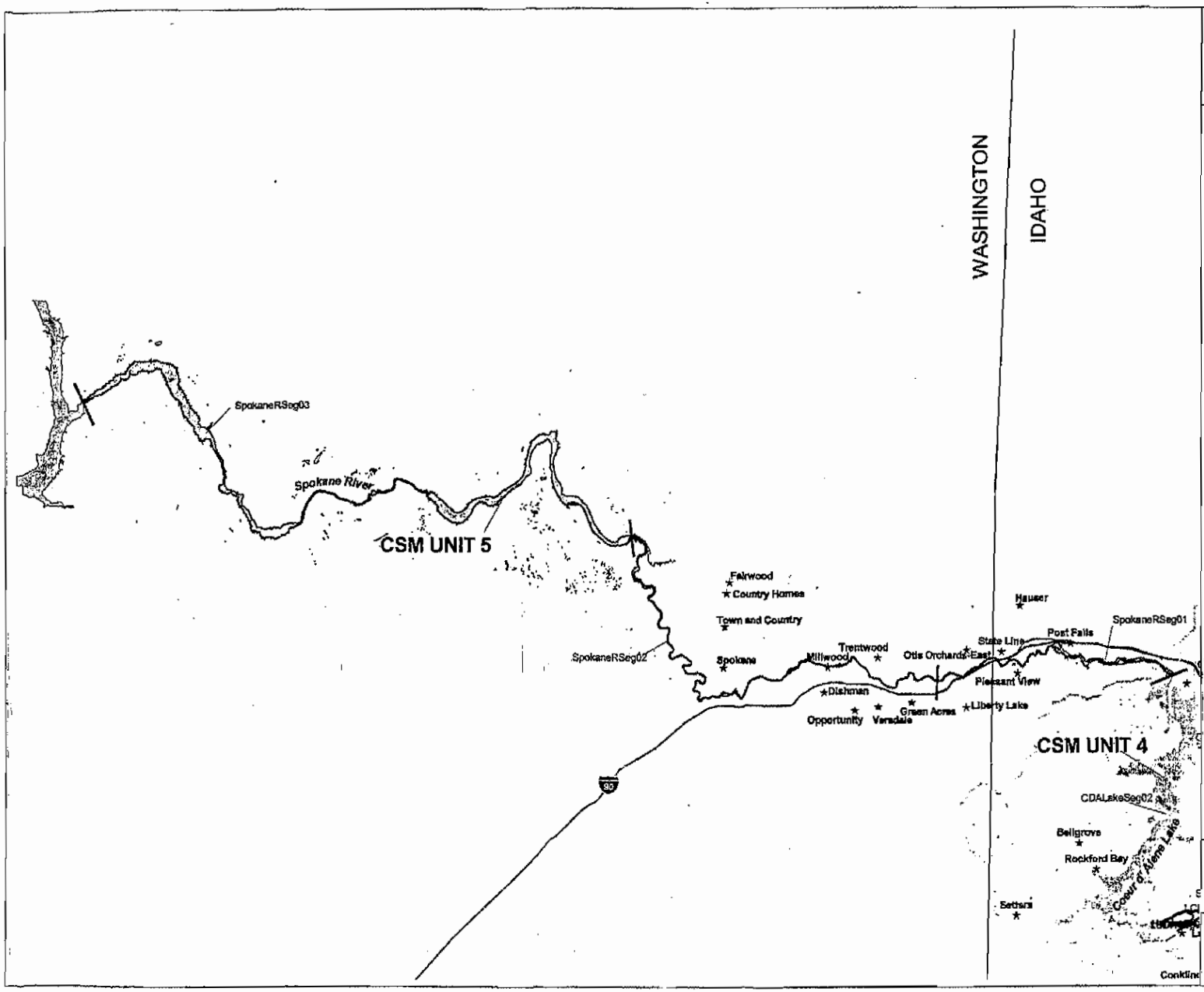

Figure 1.0-6
CSM Unit 5
Segment Boundaries

LEGEND

- City
- CSM Unit
- Interstate 90
- Lakes and Rivers
- Segment Boundary

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 470,000

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L: CSM5 REMEDY
7/2001

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Date of Plot: August 6, 2000

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 MINING HISTORY

Mining within the Coeur d'Alene Basin began more than 100 years ago. The basin has been one of the leading silver, lead, and zinc-producing areas in the world, with production of approximately 1.2 billion ounces of silver, 8 million tons of lead, and 3.2 million tons of zinc (Long 1998). The region surrounding the South Fork has produced over 97 percent of the ore mined in the basin (SAIC 1993). The Bureau of Land Management (BLM) has identified nearly 900 mining or milling-related features in the region surrounding the South Fork (BLM 1999). Table 2.1-1 provides an overview of the history of milling and tailings disposal practices in the basin.

Mining-related activities generated hazardous substances including tailings (the part of the ore from which economical concentrations of metals cannot be recovered, usually 80 to 90 percent of the ore), waste rock (non-ore rock excavated from a mine), concentrates, and smelter emissions. In addition, the water that drains from many abandoned adits contains elevated levels of metals. These hazardous substances are the sources of metals contamination in the Basin.

Until 1968, most tailings were discharged directly into the South Fork or its tributaries. Since 1968, all tailings have been impounded or placed back in the mines. Current mining practices contribute relatively little to the 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. Table 2.1-2 summarizes the quantities of tailings and metals disposed by various methods.

Most of the tailings were transported downstream, particularly during high flow events, and deposited as lenses of tailings or as tailings/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Upper and Lower Basin 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 impacted materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres.

In addition to transport in water, mining wastes have also been distributed throughout the Basin as fill material for construction of roads, railroads, and structures and as airborne dust.

2.2 REGULATORY HISTORY

The following presents a history of CERCLA-related regulatory actions within the Basin.

- 1986, Idaho settles natural resource damages (NRD) claim against the mining companies for $4.5 million.

- May1994, EPA and Idaho enter into a consent decree with the mining companies for remedial work inside 21-square mile "Box."

- March 1996, the Department of Justice (DOJ), on behalf of EPA, U.S. Department of Agriculture, and U.S. Department of the Interior, files a complaint against the mining companies, seeking:

  - Declaration of mining company liability for response costs outside the BHSS
  - Payment of natural resource damages inside and outside the BHSS

- The case filed by DOJ is consolidated with a pending claim by Coeur d'Alene Tribe

- September 1997, EPA and ASARCO sign Administrative Order on Consent (AOC) for engineering evaluation/cost analysis (EE/CA) to examine use of wetland treatment systems to address mine adit discharge in Canyon Creek.

- March 1998, district court denies U.S. motion to add 23 potentially responsible parties (PRPs) as defendants in Coeur d'Alene Basin CERCLA litigation. PRPs include smaller mining companies as well as railroad companies and others.

- September 1999, in response to motion by ASARCO, district court rules that retroactive liability under CERCLA is not unconstitutional on its face, but may violate due process "as applied."

- March 2000, EPA, Forest Service, and ASARCO sign AOC for EE/CA at Jack Waite Mine Site in watershed of North Fork of Coeur d'Alene River.

- June 2000, 9th Circuit Court of Appeals vacates decision by district court that limited scope of NPL facility to 21-square-mile BHSS. Mining companies decline to seek further appeal. Decision leaves standing EPA position that NPL facility includes all areas of Coeur d'Alene Basin where mining contamination has come to be located.

- April 2000, EPA and Union Pacific Railroad sign AOC to initiate cleanup along 72-mile railroad right-of-way through Coeur d'Alene Basin.

- August 2000, district court approves consent decree among Union Pacific, State of Idaho, Coeur d'Alene Tribe, and United States for railroad right-of-way. $30 million settlement will provide for cleanup of mining contamination within right-of-way, and conversion of right-of-way for use as recreational trail, consistent with federal Rails-To-Trails Act. Trail will be operated by the State and Tribe and funded in perpetuity by Union Pacific.

- January 2001, district court approves consent decree among Sunshine Mining Company, U.S. and Tribe, after Sunshine filed for bankruptcy under Chapter 11. Based on Sunshine's limited ability to pay, settlement requires Sunshine to conduct limited removal actions on its own property, protect timber lands, and make payments to U.S. if metals prices rise substantially over present levels.

- January 22, 2001, trial begins in district court in Boise, Idaho, with ASARCO, Hecla, and Coeur as defendants. U.S. and Tribe present evidence of mining companies' liability under CERCLA and injury to natural resources.

- April 18, 2001, U.S. and Coeur file consent decree with district court, resolving CERCLA litigation against Coeur consistent with Coeur's limited ability to pay and limited contribution of contamination to Coeur d'Alene Basin. Consent decree requires Coeur to pay $3.8 million into fund to be allocated between EPA and federal trustees; to make additional payments if silver and gold prices rise substantially over present levels; to convey a 74-acre parcel of property that may be used for a local mine waste repository; and to conduct limited removal actions, with payment of EPA oversight costs.

- May 2001, settlement discussions continue with the two remaining defendants, Hecla and ASARCO, at trial in Boise.

2.3 PAST REMOVAL ACTIONS

Some of the most highly impacted source materials have been contained under CERCLA removal actions, in the Upper Basin, to reduce health and environmental risks. In addition, extensive remedial actions have been conducted within the BHSS in accordance with the OU 1 and OU 2 RODs for that area. These remedial actions are described in Section 3.0.

2.3.1 Human Health

Previous actions to protect human health have included intervention programs and removal actions. The Lead Health Intervention Program, run by the Panhandle Health District (PHD), provides personal health and hygiene information to help reduce exposure to metals. Services include educational programs, health monitoring programs, yard and home sampling, and nursing follow-up services.

The strategy for removal actions used in the Basin is consistent with the 1998 clarification (USEPA 1998) of the 1994 Lead Directive (USEPA 1994a) and has been peer-reviewed by the EPA Technical Review Workgroup for lead (TRW). A tiered response has been implemented based on a 1000 mg/kg to 2000 mg/kg lead threshold based on success in the BHSS. As an example of the effectiveness of the intervention and soil cleanup actions, blood lead levels in children have declined by 58 percent in Kellogg (from 10.8 to 4.5 micrograms per deciliter) since the inception of remedial activities within the BHSS in 1989. First actions are targeted at homes with a pregnant resident and homes where families have children 6 years and under. Schools, daycares, and other common areas typically used by children are also in the first tier of response. Soil removal actions had been conducted at a total of 61 residential yards through the end of year 2000. A summary of time-critical removal actions conducted to protect human health is presented in Table 2.3-1.

2.3.2 Ecological

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, the Silver Valley Natural Resource Trustees (SVNRT), a cooperative effort of the Idaho Department of Environmental Quality (IDEQ) and the mining companies, has conducted significant cleanup activities. Unfortunately, given the extensive contamination and number of sources present, these source-specific actions have not significantly reduced the metals loading to the Basin.

Most of the cleanup actions have focused on source areas within Canyon Creek, Ninemile Creek, Moon Creek, Pine Creek, and the South Fork Coeur d'Alene River in the Osburn area. Other minor actions have been conducted in the Upper South Fork watershed and in the lower Coeur d'Alene River and lateral lakes areas.

Table 2.1-1
History of Tailings Disposal Practices in the Coeur d'Alene Basin

Date	Milestone
1886	Processing of ore initiated using jigging.
1891	Six mills operating, with a total capacity of 2,000 tons per day
1901-1904	Construction of plank dams on Canyon Creek near Woodland Park and on the South Fork near Osburn and Pinehurst to control tailings movement. Large volumes of tailings accumulate behind the dams.
1905	Jig tailings from the Morning mill contained about 8% lead and 7% zinc.
1900-1915	Recovery of zinc initiated during this period. Previously, zinc was not recovered, and mills primarily processed low-zinc ores.
1906	Total milling capacity in the basin was 7,000 tons per day
1910	Flotation introduced in the basin at the Morning mill. Increased metals recoveries were achieved using flotation. Flotation tailings were finer grained than jig tailings and were transported greater distances by streams.
1917	Plank dams at Woodland Park and Osburn breached by flood waters.
1918	Flotation had been adopted at most mills by this time.
mid-1920s	Tailings observed in Spokane River.
1925	Flotation tailings from the Morning mill contained <1% each of lead and zinc.
1926-1928	Bunker Hill mills began placing tailings at Page Pond and the present-day location of the Central Impoundment Area.
1932	Dredging operations initiated in Lower Coeur d'Alene below Cataldo. Dredging continued until 1967. Dredge spoils were placed at Mission Flats.
1933	Plank dam near Pinehurst breached by flood waters.
1940-1942	Addition of 12 new mills with a combined capacity of 2,000 tons per day. Total milling capacity in the basin was 12,000 tons per day.
1940s	A portion of the tailings that had accumulated behind the Osburn and Woodland Park plank dams were reprocessed for metals recovery.
Late 1950s	Reuse of tailings as stope fill initiated.
1960s	Start of I-90 construction. Tailings from Mission Flats and Bunker Hill tailings pond used in embankment construction.
1968 to present	All tailings impounded or used as stope fill.

Table 2.1-2
Preliminary Estimate of Mill Tailings Produced in the Coeur d'Alene Mining District

Disposal Method[a]	Dates	Tailings (ton)	Metals Contained in Tailings (ton)		
			Silver	Lead	Zinc
To creeks	1884-1967	61,900,000	2,400	880,000	>720,000
To dumps	1901-1942	14,600,000	400	220,000	>320,000
Mine backfill	1949-1997	18,000,000	200	39,000	22,000
To impoundments	1928-1997	26,200,000	300	109,000	180,000
Total	1884-1997	120,700,000	3,300	1,248,000	>1,242,000

[a]Long (1998) defines dumps as unsecured stockpiles of tailings. Impoundments are secured by dams or other structures. Many impoundments were built over and from older tailings dumps.

Source: Long (1998)

Table 2.3-1
Removal Actions for Protection of Human Health by Year

Actions	1997	1998	1999	2000	Total to Date
Residential yards	7	10	23	21[a]	61
Schools/daycares	1[b]	-	3	2	6
Recreational areas	-	-	4	1	5
Educational signage	-	-	9	-	9
Bottled water	-	-	10	1	11
End of tap water treatment	-	-	4	1	5
Municipal water hookup	-	-	6	-	6
Cubic yards of contaminated soil removed	1,935	1,500	20,000	12,000	35,465
Cost	$149,000	$187,252	$2,274,243	$1,200,000	$3.8M

[a] 2000 yard tally includes 20 residential properties and 1 trailer park. Also, 2 homes with exterior lead-based paint were pressure-washed prior to removal of the contaminated soil.
[b] Silver Hills Middle School was started in 1997 and completed in 1998 due to extremely large size and coordination with school schedules.

3.0 SCOPE AND ROLE OF RESPONSE ACTION

The site has been divided into four operable units: the populated areas of the BHSS (OU 1); the non-populated areas of the BHSS (OU 2); the discharge of acid mine drainage from the Bunker Hill mine (OU 3); and mining-related contamination in the broader Coeur d'Alene River Basin (OU 4). The action currently under review by the NRRB is primarily focused on OU 4. A brief summary of the four operable units is provided below.

Records of Decision (RODs) have been signed for OU 1 (in 1991) and OU 2 (in 1992). An RI/FS was initiated for OU 3 in 1998 to address the long-term management of acid mine drainage (AMD) from the Bunker Hill mine. The RI/FS was released in April 2001, and the proposed plan is scheduled for release in July 2001. Also in 1998, EPA initiated an RI/FS for OU 4. Draft versions of the RI and FS were released for public comment in 2000.

3.1 OPERABLE UNIT 1

The populated area operable unit of the BHSS (OU 1) includes residential and commercial properties, right-of-ways (ROWs), and public use areas in the towns of Kellogg, Wardner, Smelterville, Pinehurst, and several smaller unincorporated communities. Cleanup activities began in OU 1 as this was the area of greatest concern for human health exposure. In 1985, a Lead Health Intervention Program (LHIP) was initiated by the Centers for Disease Control and the Agency for Toxics Substances and Disease Registry (ATSDR) to minimize blood lead levels in children through health education, parental awareness, and biological monitoring. The program is ongoing to date and is administered by the local Panhandle Health District under the Idaho Department of Health and Welfare.

In 1986, some city parks and school playgrounds were cleaned up as part of a CERCLA removal action. The yard soil removal program was initiated in 1989 as a CERCLA time critical removal action to replace contaminated soils in yards of young children at highest risk of lead poisoning. Since 1994, the yard soil removal program has been implemented by the potentially responsible parties (PRPs) pursuant to the 1991 populated area ROD. The PRPs are scheduled to remediate 200 residential parcels each year until all yards, commercial properties, and ROWs with lead contaminated soils greater than or equal to 1,000 parts per million (ppm) have been remediated to achieve a community-wide average of 350 ppm lead. Completion of remedial activities in the populated area is expected by 2003.

House dust, long recognized as a primary source of lead exposure among children, is being monitored through the LHIP. Should house dust lead levels remain elevated following completion of remediation, homes with dust lead concentrations greater that 1,000 ppm will be

evaluated for interior remediation. A five-year review of OU 1 was completed in 2000. The review document further describes OU 1 cleanup activities.

3.2 OPERABLE UNIT 2

The non-populated area operable unit of the BHSS (OU 2) includes the former industrial complex and mine operations area, river flood plain, hillsides, various creeks and gulches, site surface water and ground water, and the Central Impoundment Area (CIA). Site PRPs performed various removal activities pursuant to several orders prior to the 1992 ROD, including smelter stabilization efforts from 1989 to 1993, and hillsides revegetation and fugitive dust control efforts from 1990 to 1992.

Following completion of the ROD in 1992, five PRPs signed a Consent Decree with EPA to perform cleanup activities in limited areas of OU 2, including the Union Pacific Railroad right-of-way (UPRR), the A-4 gypsum pond (Stauffer Chemical), and the Page Pond tailings repository. In 1995, EPA and the State of Idaho entered into a State Superfund Contract to perform the remaining site remedial actions. Cleanup actions addressed in the ROD included a series of source removals, surface capping, reconstruction of surface water creeks, demolition of abandoned milling and processing facilities, engineered closures for waste consolidated on site, revegetation efforts, and surface water and groundwater controls and treatment in a constructed wetlands treatment system. There has been one ROD amendment (September 1996) and two Explanation of Significant Differences (January 1996 and April 1998) since the ROD was completed in 1992. A five-year review of OU 2 was completed in 2000. The review document further describes OU 2 cleanup activities.

In the State Superfund Contract, EPA and the State of Idaho agreed to a two-phased site implementation strategy. Phase I largely addresses source removals aimed at consolidating extensive contamination from various areas of the Site. Phase I cleanup activities are estimated to be mostly complete in 2001. Phase II will address site surface water and groundwater cleanup and will be implemented following completion of source control and removal activities and evaluation of the effectiveness of these activities in meeting water quality improvement objectives.

3.3 OPERABLE UNIT 3

At the time the non-populated areas ROD was written in 1992, the CTP was under private ownership and was anticipated to so remain. The ROD, therefore, did not address control of AMD from the Bunker Hill Mine, or operation of the CTP, in any significant way. It briefly addressed the mine water by requiring that it continue to be treated in the CTP prior to discharge to a wetlands treatment system for removal of residual metals. The wetlands treatment system, as noted above, was found to be unreliable on a year round basis.

The 1992 ROD did not contain or otherwise identify any plans for the control or long-term management of the mine water. Subsequent to the ROD, some measures were taken to reduce mine water flows. Between December 1994 and February 1995, the New Bunker Hill Mining Company (NBHMC, the current mine owner/operator) plugged 72 drill holes within the mine that were discharging water. They also placed a concrete bottom in the reservoir behind the Bunker Hill Dam in mainstem Milo Creek. This was done to reduce leakage to underlying mine workings. In 1998 and 1999, a water diversion project was implemented on the mainstem of Milo Creek. The purpose of the project was to minimize contact between Milo Creek surface water and tailings/waste rock on the valley floor, and to reduce infiltration into the mine workings underlying that stretch of Milo Creek. Although, to date, the effectiveness of these measures to reduce infiltration cannot be determined, it is believed that AMD flows, and particularly the seasonal peak flows, can be significantly reduced by additional measures.

The ROD also did not address the long-term management of treatment residuals (sludge) from the CTP, which are currently pumped into an unlined pond on the CIA. At current disposal rates it is estimated that the pond will be filled in 3 to 5 years. In addition, the 1992 ROD acknowledged that development of a total maximum daily load (TMDL) for the South Fork, as required by the Clean Water Act, was being considered. At the time of the ROD, however, the TMDL was not developed.

In September 1996, the United State District Court for the Western District of Washington ordered EPA and the State of Idaho to develop a schedule for completion of TMDLs for all water quality impaired streams earlier identified by the state, including the Coeur d'Alene River Basin. TMDL development was initiated in 1998. In August 2000, a TMDL for dissolved cadmium, lead, and zinc in surface waters of the Basin was jointly released by EPA and the State of Idaho.

In February 1998, EPA and the Idaho Department of Environmental Quality (IDEQ) released a jointly-prepared memorandum that described additional considerations for the long-term management of the mine water at the Bunker Hill site. The joint memorandum identified the need to begin further evaluations for long-term mine water management, including achievement of the TMDL and long-term sludge disposal. With this memorandum, IDEQ and EPA jointly initiated the RI/FS process for OU 3. A joint work group including representatives from EPA, IDEQ, contractors for both agencies, and the NBHMC worked together in developing the RI/FS, which was released in 2001. The Proposed Plan for OU 3 in under development and the start of the public comment period is expected in late summer or fall 2001.

3.4 OPERABLE UNIT 4

At the time the 1992 non-populated areas ROD was written it was widely recognized that: mining related contamination in North Idaho was not limited to the areas surrounding the BHSS. Actions selected in the ROD did not address sources of contamination upgradient of the BHSS, and while selected actions were expected to have significant benefits over time to downgradient

water quality, active remediation of the South Fork was beyond the scope of the ROD. To address these and other contamination and water quality issues in the broader Coeur d'Alene Basin, the EPA, State of Idaho, the Coeur d'Alene Tribe and other federal, state and local agencies formed the Coeur d'Alene Basin Restoration Project. The purpose of this project was to integrate water quality improvement programs in the Basin through coordination of the federal regulatory authorities under the Clean Water Act, CERCLA, and RCRA, and other state, local, and tribal programs.

The first comprehensive study of human health effects outside of the BHSS was conducted in 1996 by the State of Idaho. Approximately 15 percent of children (under 10 years of age) in the Silver Valley were tested in 1996 and 1998 and found to have lead levels above EPA's 10 µg/dl level of concern. Within the BHSS, which had been partially remediated at this time, 12 percent were above the level of concern. In 1998, EPA initiated a RI/FS for the Coeur d'Alene Basin.

The BHSS is located within the area being investigated as part of the of the Basin project. The remedial actions conducted within the non-populated areas of the Site are being reviewed and considered in the Basin RI/FS process. For example, an evaluation of metals loading from all sources in the Basin, including the non-populated areas (OU 2), is included in the RI/FS. It is possible that additional cleanup actions in the non-populated area may need to be considered if determined necessary to meet overall cleanup goals for the Basin. It is also possible that cleanup technologies and strategies being considered for the Bunker Hill mine water, such as water treatment and sludge management, may be similar or compatible with those considered for the Basin. This overlap may provide opportunities that benefit cleanup in both OUs.

3.5 TOTAL MAXIMUM DAILY LOADS (TMDLS)

As described in Section 3.3, TMDL load allocations have been developed for the Coeur d'Alene Basin. Sources from OUs 2, 3, and 4 and, to a lesser degree, OU 1 contribute to the metals load in the Basin.

The CERCLA process and TMDLs are complementary, as shown in Figure 3.5-1. The RI provided data to the TMDL for developing source load allocations. In the Basin, an estimated 8 percent of the total load is derived from discrete sources (e.g., operating mines, adit discharges, sewage treatment plants), and an estimated 92 percent of the total load is derived from non-discrete sources. Figure 3.5-2 shows the load sources. The load sources are used as the basis for waste load allocations, which are translated into NPDES permit limits for operating sources.

The gross load allocations by river segment serve as guidelines for the Basin remedy, along with other ARARs and human health and ecological risk-based goals. In the Basin, gross load allocations have been established at the mouth of Canyon Creek, the mouth of Ninemile Creek, the South Fork at Wallace, the mouth of Pine Creek, the South Fork and North Fork just above their confluence, the Coeur d'Alene River where it empties into Coeur d'Alene Lake, and the Spokane River at the Idaho-Washington border.

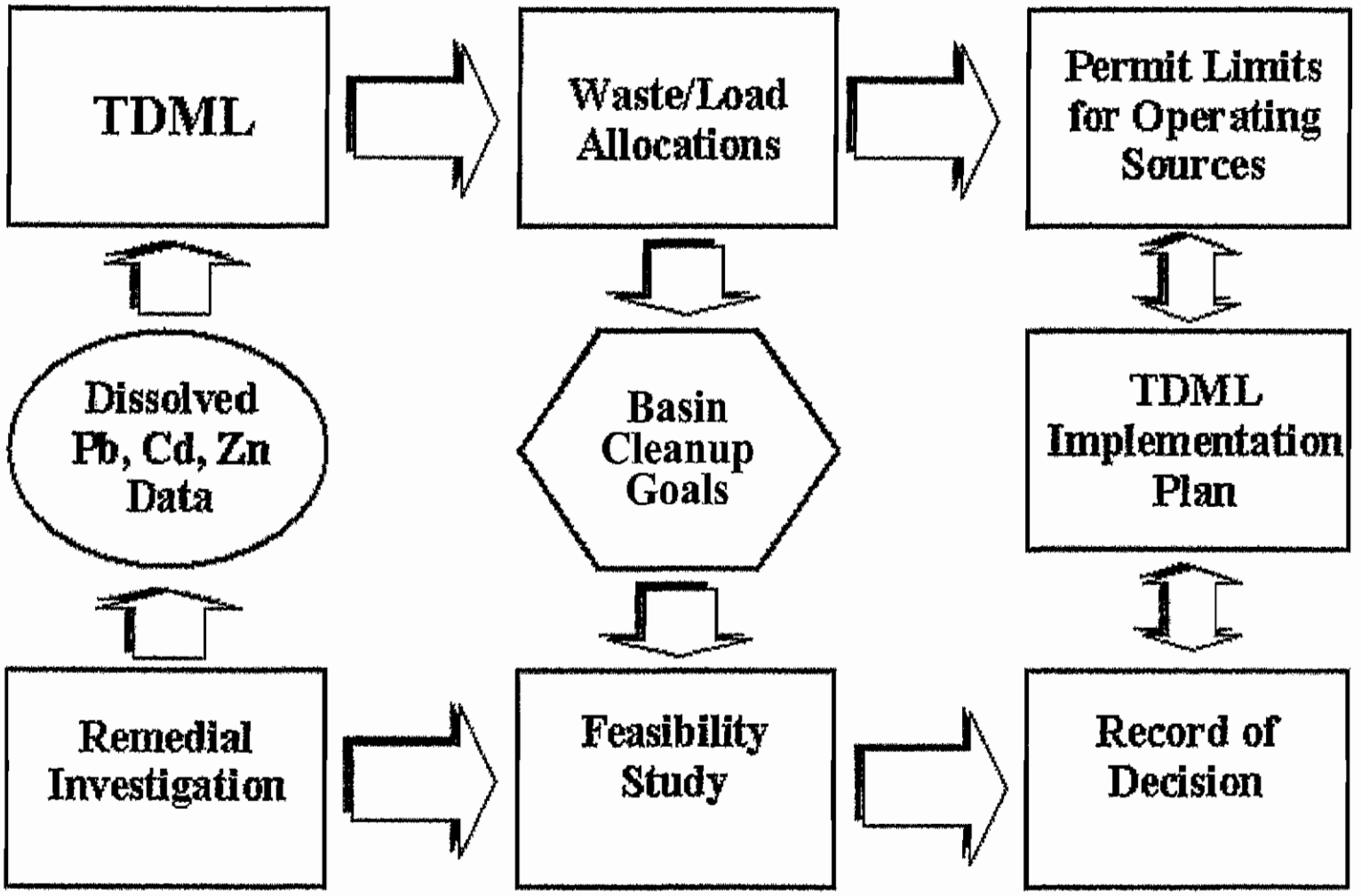

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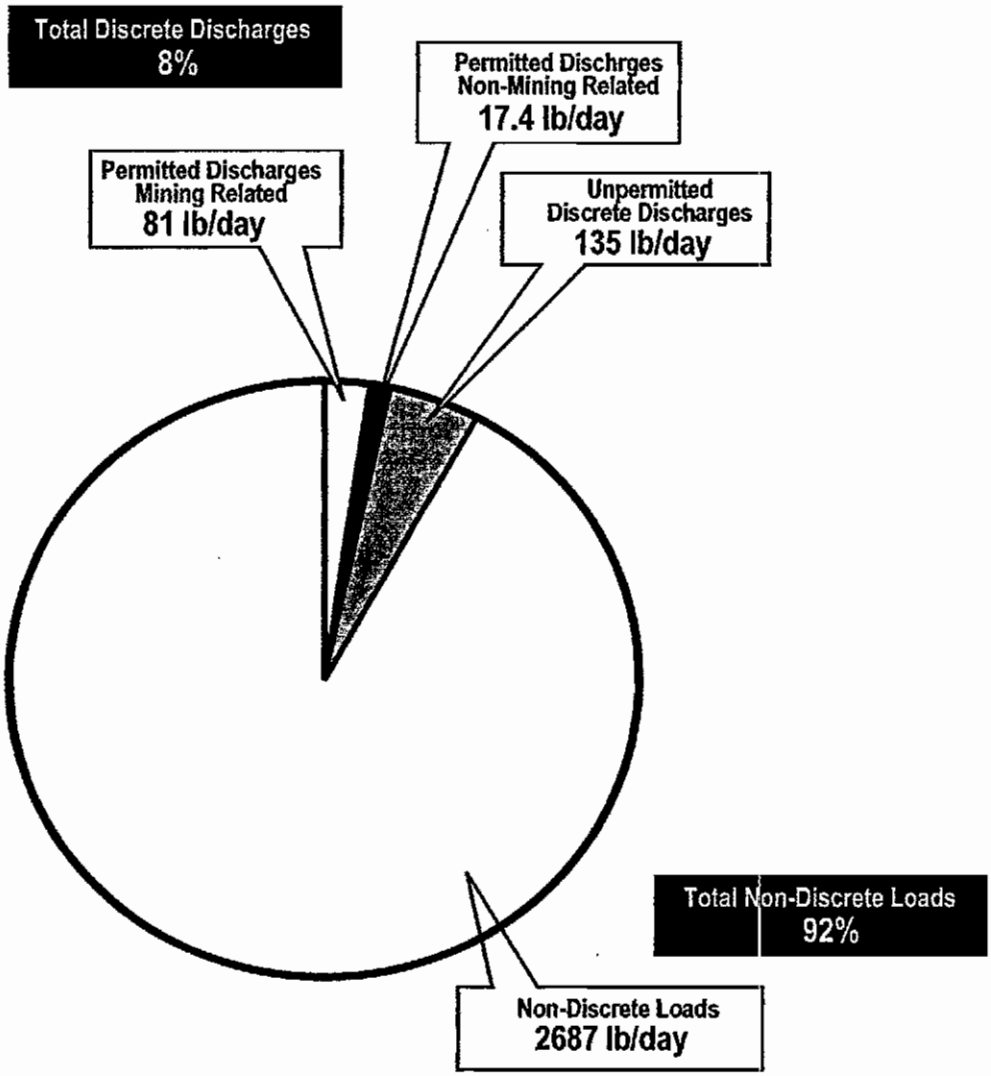
Figure 3.5-1
CERCLA and CWA Integration in the Coeur d'Alene Basin



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	RRB6	**Figure 3.5-2** **Discrete and Non-Discrete Sources of Dissolved Zinc Load in the South Fork**

4.0 SITE CHARACTERISTICS

4.1 GEOGRAPHY

The Coeur d'Alene Basin, as defined for the RI/FS, extends from the Idaho-Montana border in the Bitterroot Mountains west to the confluence of the Spokane River and the Columbia River at Roosevelt Lake. The Coeur d'Alene Basin RI/FS includes the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River. The Coeur d'Alene River Basin encompasses approximately 1,475 square miles (3,800 square kilometers).

To facilitate evaluation of risks and remedial alternatives, the Basin was divided into five conceptual site model (CSM) units that are differentiated based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes. The five CSM units are:

- CSM Units 1 and 2, Upper Basin (Figures 1.0-2 and 1.0-3)
- CSM Unit 3, Lower Basin (Figure 1.0-4)
- CSM Unit 4, Coeur d'Alene Lake (Figure 1.0-5)
- CSM Unit 5, Spokane River (Figure 1.0-6)

The CSMs are described in further detail in Section 4.1.2.

Based on the results of the RI (URSG and CH2M HILL 2000b), the human health risk assessment (TerraGraphics and URSG 2000), and the ecological risk assessment (URSG and CH2M HILL 2000a), the FS study area focused on the areas with the greatest human health and ecological risks. The study areas for development of human health and ecological alternatives are organized differently , and are defined in the following sections.

4.1.1 Geographical Organization of the Human Health Alternatives

For development of human health alternatives, eight major areas were identified based on projected human exposure scenarios and public use patterns (Von Lindern 2000b). These areas differ from the CSM Units because prior analyses showed that not all portions of the CSM Units were a concern to human health (URSG 1999). In addition, human exposure in several areas crossed over CSM Unit boundaries or only included portions of CSM Units. Therefore, for the purpose of evaluating human health risk and potential remediation requirements, it was necessary to redefine study areas based upon human health exposure. Figure 4.1-1 shows these eight investigation areas. Specifically, they are:

- **Mullan** includes the town of Mullan and the uppermost portion of the South Fork of the Coeur d'Alene River and its tributaries, from Wallace to the headwaters of the river.

- **Burke/Ninemile** (includes Canyon Creek) includes the Canyon Creek and Ninemile Creek tributaries of the South Fork watershed, excluding the upper reaches of Canyon Creek. Communities along Canyon Creek include Frisco, Burke, Mace, Cornwall, Yellow Dog, Black Bear, Gem, and Woodland Park. Ninemile Creek communities include Black Cloud, Day Rock, McCarthy, and Zanettiville.

- **Wallace** includes the town of Wallace, which is located in the canyon of the South Fork of the Coeur d'Alene River at the river's confluence with Canyon, Ninemile, and Placer Creeks.

- **Silverton** includes the town of Silverton, which lies along Interstate 90 between Osburn and Wallace.

- **Osburn** includes the town of Osburn and the small community of Polaris, which are located immediately south of Interstate 90 and the Coeur d'Alene River.

  Side Gulches includes Moon Creek and Gulch, a portion of the South Fork watershed, and residential areas of the Big Creek watershed. Montgomery, Nuckols, and Terror Gulches are also included, as well as Sunny Slopes, Twomile, and Elk Creek.

  Kingston includes the towns of Kingston and Cataldo, portions of the Pine Creek watershed, and portions of the South Fork and North Fork watersheds. Residences along a portion of the Pine Creek watershed are included in the Bunker Hill area and are not included in the Kingston area.

- **Lower Basin** includes all of the Coeur d'Alene River west of Cataldo to Harrison, at the mouth of Lake Coeur d'Alene.

4.1.2 Geographical Organization of the Ecological Alternatives

For development of ecological alternatives, four areas were identified based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes: the Upper Basin (CSM Units 1 and 2); the Lower Basin (CSM Unit 3); Coeur d'Alene Lake (CSM Unit 4); and the Spokane River (CSM Unit 5). These areas are shown on Figures 1.0-2 through 1.0-6.

Upper Basin encompasses the steep mountain canyons of the South Fork and its tributary gulches. The Upper Basin is the source area for most of the mining-related waste materials, and includes the Canyon Creek, Ninemile Creek, Big Creek, Moon Creek, and Pine Creek tributary watersheds. The upper basin drains an area of 300 square miles. The channel and riparian zone of the South Fork and certain of its tributaries have undergone extensive channelization and other alterations as a result of mining-related activities and other anthropogenic activities, including the construction of the I-90 freeway.

Lower Basin includes the lateral lakes and extensive floodplain wetlands. For alternative development, the study area is limited to the 100-year floodplain. Below Cataldo, the river flows into a broad, flat valley and takes on a meandering, depositional character with a fine sediment bottom. Much of the tailings released to streams in the Upper Basin were transported to and deposited within the Lower Basin, largely during flood events. From Rose Lake downstream, the river surface elevation is controlled by Post Falls Dam on the Spokane River near the outlet from Coeur d'Alene Lake.

Coeur d'Alene Lake encompasses 49.8 square miles at full pool elevation (2128 feet above sea level), with a maximum water depth of 209 feet. Its principal tributaries are the St. Joe's River and the Coeur d'Alene River. The lake has a drainage area of 3,741 square miles. The discharge from the lake forms the Spokane River. The lake's elevation is controlled by the Post Falls Dam. The lake is classified as oligotrophic.

Spokane River flows from Coeur d'Alene Lake and is dammed at six locations above its terminus at Lake Roosevelt. For alternative development, the study area is limited to depositional areas identified by the Washington Department of Ecology (Ecology) between the Washington-Idaho state line and Upriver Dam. Within the study area, the river bed primarily consists of coarse gravel and cobbles, and the floodplain and riparian zone are relatively narrow. The Washington State Department of Ecology (Ecology), EPA, and the Spokane Tribe are continuing to evaluate the river downstream of Upriver Dam, and the need for actions in these areas will be considered in the future.

The site was further subdivided into watersheds, segments, and sources. The Upper Basin includes tributary watersheds that are sources of mining-related contamination. These tributary watersheds are the Upper South Fork, Canyon Creek, Ninemile Creek, Big Creek, Moon Creek, and Pine Creek watersheds. The watersheds were further subdivided into one or more segments based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes. Finally, individual mining-related source areas were identified based on mapping conducted by the U.S. Bureau of Land Management. The source areas are located in the Upper Basin.

4.2 NATURE AND EXTENT OF CONTAMINATION

4.2.1 Nature and Extent of Contamination with Respect to Human Health

As a result of natural dispersion processes, high concentrations of metals in mine tailings, mine waste, and mine drainage have been transported to adjacent groundwater, surface water, sediment, soil, and dust. The primary media of concern for human health are:

- Contaminated soil in home yards, street rights-of-way, abandoned and active commercial and undeveloped properties, and common areas, and airborne dust generated at these locations
- Contaminated house dust, originating primarily from contaminated soil
- Drinking water from local wells or surface water
- Contaminated fish
- Homegrown vegetables

People in the Basin can be exposed to contaminants of potential concern by ingesting soil, breathing dust, drinking water, and eating contaminated fish or homegrown vegetables. The contaminants of potential concern are:

- Seven metals in soil: antimony, arsenic, cadmium, iron, lead, manganese, and zinc
- Seven metals in house dust: antimony, arsenic, cadmium, iron, lead, manganese, and zinc
- Five metals in groundwater: antimony, arsenic, cadmium, lead, and zinc
- Five metals in surface water: arsenic, cadmium, lead, manganese, and mercury
- Two metals in tap water: lead and arsenic

Although fish and vegetables were not screened for COPCs, indicator metals were selected for these based on toxicity and presence in the Basin. The selected indicator metals for fish consumption were cadmium, lead, and mercury, and for vegetables were arsenic, cadmium, and lead. Although not considered a primary medium of concern in the HHRA, problem with interior lead-based paint were considered to be a contributor to lead concentrations children's blood in about 30 percent of the cases where the blood lead level exceeded 10 µg/dl. These are important sources that are addressed on a case-by-case basis.

Exposures to lead in soil and dust from the home and surrounding communities are the primary human health concerns in the Basin. Figures 4.2-1 and 4.2-2 show lead concentrations in yard soil and house dust in the eight community areas investigated.

The actual quantities of waste removed, contained, or treated would vary depending on the remedial approach. For the human health alternatives, quantities are summarized in terms of number of residences exceeding cleanup levels for each of the primary potential exposure media. The estimated number of residences with lead in yard soil at concentrations exceeding PRGs of 700 mg/kg and 1,000 mg/kg are shown in Table 4.2-1. Although groundwater contamination is observed in the Basin, an insufficient number of monitoring wells have been installed to identify plumes and isoconcentration contours. The estimated numbers of residences with drinking water containing metals at concentrations exceeding one or more maximum contaminant levels (MCLs) are shown in Table 4.2-2. Estimated numbers of residences with house dust containing lead at concentrations exceeding potential thresholds are shown in Table 4.2-3.

Soil, sediment, and surface water are impacted at beaches and recreational areas. Figure 4.2-3 shows an overview of sediment, soil, and surface water impacts at selected river and stream locations in the Basin. Figure 4.2-4 shows graphically the widespread distribution of lead concentrations above EPA's emergency action level (2,000 mg/kg) for protection of human health in soil and sediment samples in the Basin. The figure shows four concentration ranges:

- 0 to 175 mg/kg (175 mg/kg equals the 90 percent upper confidence interval of the background lead concentration)
- 175 mg/kg to 500 mg/kg
- 500 mg/kg to 2,000 mg/kg
- Greater than 2,000 mg/kg

4.2.2 Nature and Extent of Contamination with Respect to Ecological Receptors

Contaminated media that potentially affect ecological receptors are surface water, soil, and sediment. In addition, groundwater is important as a pathway for migration of metals to surface water. The primary metals of concern for ecological protection are cadmium, lead, and zinc.

To help characterize the nature and extent of contamination and to develop remedial alternatives, the contaminated media were grouped by "source type" in the FS. These sources types are based on the mining-related primary sources (tailings, waste rock, and adit drainage) and the secondary sources, or impacted media (floodplain sediments, river banks and beds, wetlands, lateral lakes, dredge spoils, and lake bottom sediments) present in the Basin. To provide a perspective on the

volumes of source types which need to be addressed, Table 4.2-4 presents an overview of the volume of impacted materials in the Basin.

In the Upper Basin (CSM Units 1 and 2), metals-impacted sediments in the current and historic 100-year floodplain are the major sources of metals in the streams and river. An estimated 7 million cubic yards (cy) of impacted sediments are present. However, an estimated 3 million cubic yards (cy) of these sediments are potentially inaccessible for excavation because they are beneath the I-90 embankment, other roads, or residential or commercial structures. These sediments still represent a metals loading to the Basin as they are subject to leaching by groundwater with subsequent discharge into surface waters. A total of nearly 3,000 acres of the Upper Basin have been disturbed by mining activities.

In the Lower Basin, erosion of stream banks is a major source of metals, particularly lead, into the Coeur d'Alene River. There are an estimated 1.8 million cy of impacted bank materials subject to erosion. Downstream wetlands, 100-year floodplains, and lateral lake sediments are the major source of metals ingested by waterfowl and other animals. There are about 13,000 acres of these sediments that contain more than 1,000 mg/kg of lead. The area containing more than 1,000 mg/kg of lead represents 72% of the 18,000 acres of floodplain habitat present in the Lower Basin.[2] The Lower Basin includes the Cataldo/Mission Flats area, where tailings were dredged from the river and placed within the 100-year floodplain. An estimated 13 million 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 approximately 75 million metric tons of contaminated sediments at the bottom of the lake. Studies by the USGS indicate that under current lake conditions, there is some movement of the metals from the sediment into the water column in the dissolved phase; however, the currently available data indicate that the lake acts as a sink for metals discharged from the Coeur d'Alene River. Table 4.2-5 shows the net retention of metals in the lake, where retention is the difference between the metal load into the lake and the load out of the lake, expressed as a percentage of the load into the lake. Cadmium retention ranged from 47 to 56 percent and averaged 52 percent. Lead retention ranged from 82 to 92 percent and averaged 89 percent. Zinc retention ranged from 31 to 43 percent and averaged 38 percent.

Estimated average metals concentrations and loads (the amount of metal transported in a stream, in pounds per day) were calculated from all surface water data collected from 1991 to 1999. The Upper Basin is the primary source of dissolved zinc in the river system. The estimated average dissolved zinc load in the South Fork just above the confluence with the North Fork (South Fork at Pinehurst) is about 79 percent of the load that discharges to the lake (Lower Coeur d'Alene at Harrison). Zinc (Figure 4.2-5) is present primarily in the dissolved form in surface water and

[2] Estimates of remediation areas and associated costs are based on a lead concentration of 1,000 mg/kg. The chronic effects remediation goal for waterfowl is 500 mg/kg. The difference in remediation areas based on 500 and 1,000 mg/kg lead is small, and less than the contingency included in the cost estimate.

occurs largely as a result of infiltration of groundwater contaminated by tailings-impacted sediments into surface water. 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.

The Lower Basin is the primary source of total lead in the river system. The increase in total lead load below the confluence of the North and South Forks is about 1,090 pounds per day, or about 72 percent of the load that discharges to the lake. Lead (Figure 4.2-6) tends to bind more strongly to soil particles than zinc does, and the lead load is largely due to erosion of soil and sediment, particularly during high flow periods.

Relatively little of the dissolved metals in the river system come from discrete sources. Discrete sources include mining-related NPDES-permitted discharges (including the treatment plant for the Bunker Hill mine water discharge), non-mining-related NPDES-permitted discharges, and unpermitted discrete discharges (adit and seep discharges). The estimated loads from the discrete discharges account for only about 8 percent of the estimated dissolved zinc load and about 3 percent of the total lead load in the South Fork at Pinehurst (Figure 3.5-2).

Groundwater associated with the impacted sediments in the valley fill aquifers of the Upper Basin is the primary source of dissolved metals loading in the river and streams. Surface and groundwater percolates through the tailings-impacted sediments and dissolves metals. The water discharges into the streams and rivers, carrying the dissolved metal load with it. Metals loading is enhanced by the relatively large degree of surface water/groundwater interaction that occurs in some parts of the Upper Basin. In areas where the valley floor widens, streams lose water to the valley fill aquifer ("losing reach"). In areas where the valley floor constricts, groundwater discharges back into the streams ("gaining reach"), carrying additional metals load. The USGS studied the surface water/groundwater interaction (Barton 1999). Figures 4.2-7 and 4.2-8 show the results of the studies in lower Canyon Creek and the South Fork within the BHSS in September 1999. These studies confirm that most of the dissolved zinc load in the study areas was gained by the streams in the gaining reaches.

Elevated levels of metals are present in Spokane River sediments. Figures 4.2-9, 4.2-10, and 4.2-11 present concentrations of cadmium, lead, and zinc, respectively, measured in 63 sediment samples. Based on these data, about 25% of samples contained cadmium above the upper background concentration, about 82% of samples contained lead above the upper background concentration, and about 90% of samples contained zinc above the upper background concentration. Because there are relatively few depositional areas along the Spokane River, the volume of contaminated sediments is small compared to the Upper Basin and Lower Basin. An estimated volume of 260,000 cy of contaminated sediments are present upstream of Upriver Dam. Additional contaminated sediments are present downstream of Upriver Dam, but have not been quantified.

Surface water in Coeur d'Alene Lake and the Spokane River has been impacted by metals. The water in the Lake exceeds the water quality standards for cadmium and zinc and intermittently

for lead. In samples from the Spokane River analyzed for the RI, 21% contained cadmium exceeding a screening level of 0.9 µg/L, 48% contained lead exceeding a screening level of 0.66 µg/L, and 68% contained zinc exceeding a screening level of 30 µg/L.

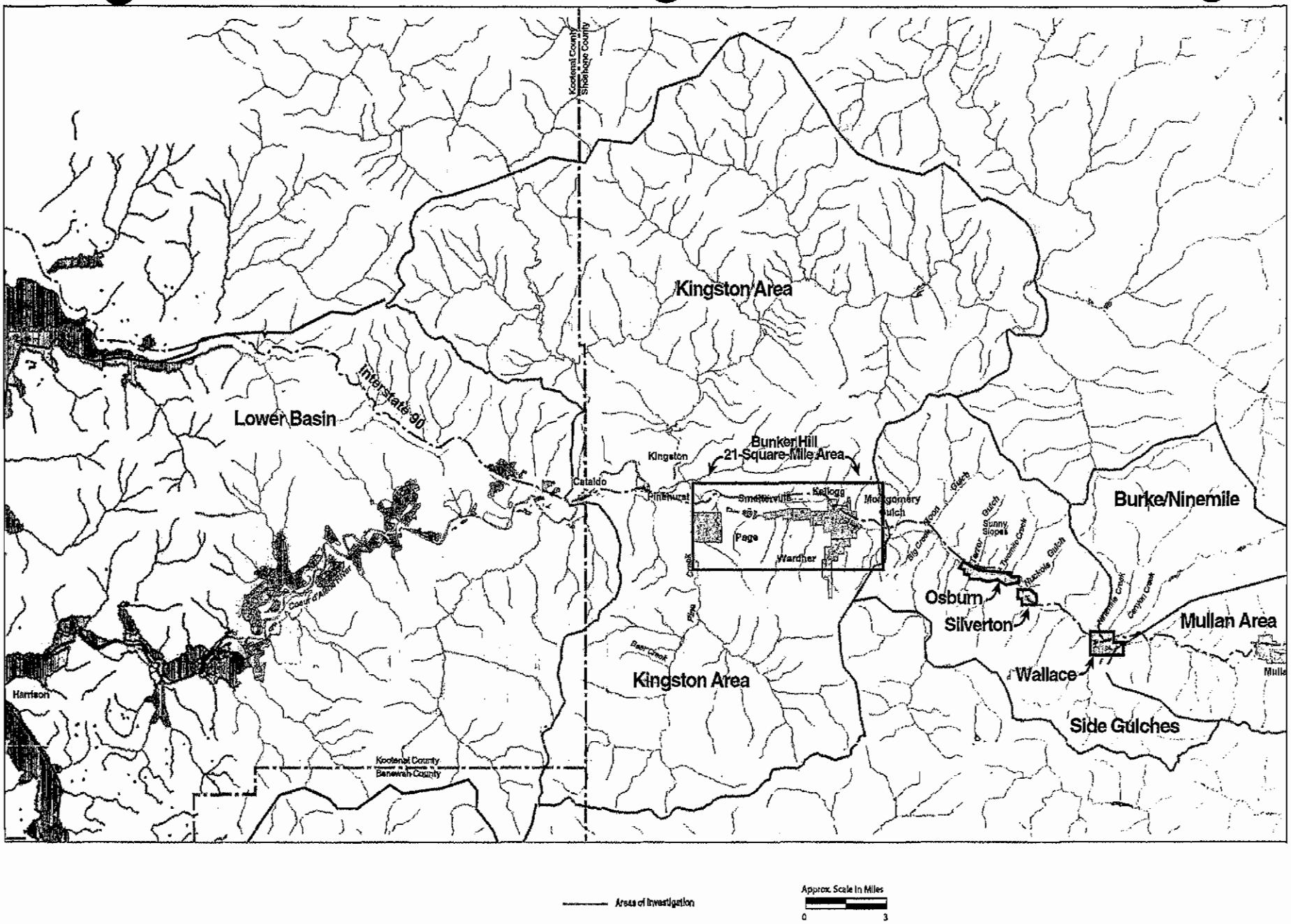


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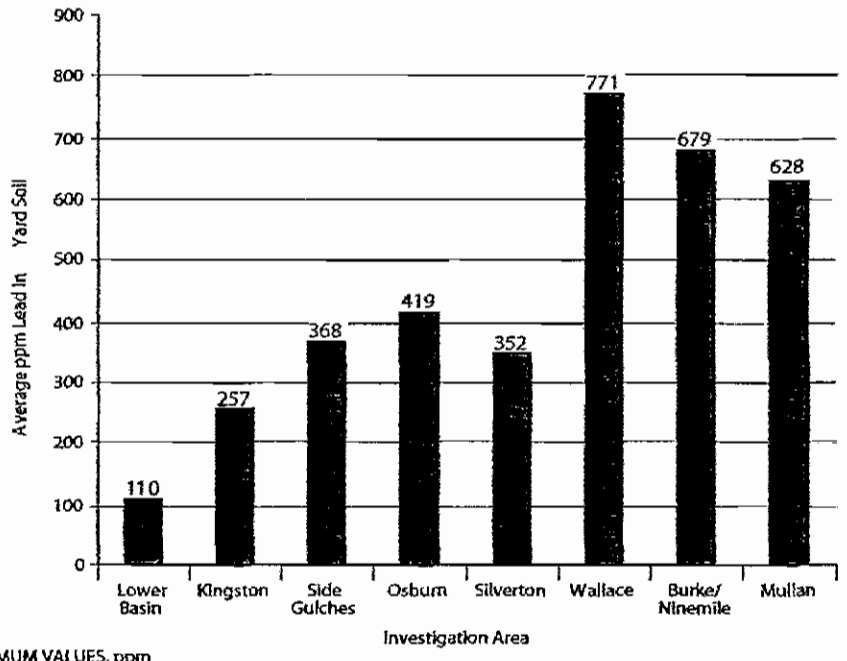
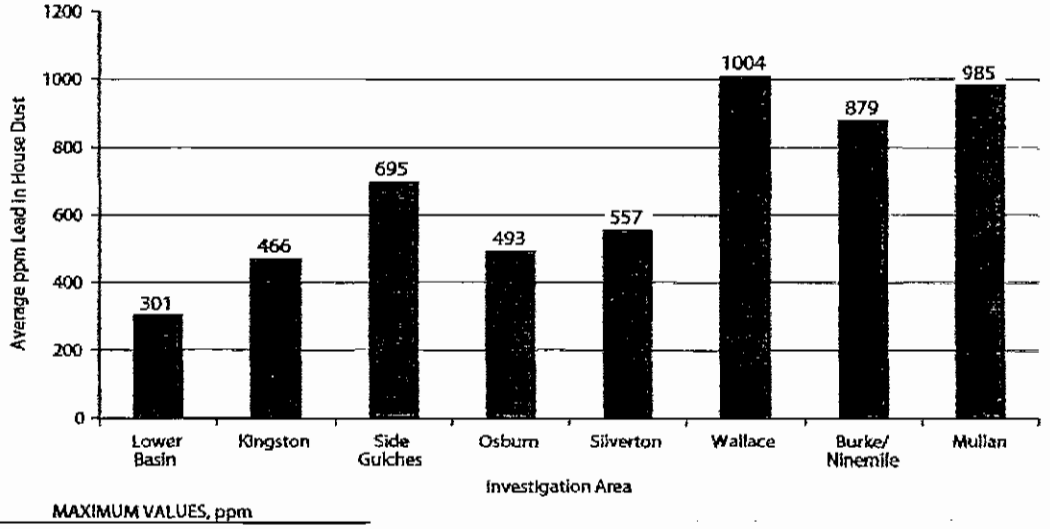
Figure 4.1-1
Human Health Alternatives Investigation Areas



MAXIMUM VALUES, ppm			
Lower Basin	7350	Silverton	6098
Kingston	0229	Wallace	16026
Side Gulches	3356	Burke/Ninemile	5410
Osburn	12884	Mullan	20218

NOTE: Data from Human Health Risk Assessment, TerraGraphics Environmental Engineering, 2000.

Figure 4.2-1
Lead Levels in Yard Soil



MAXIMUM VALUES, ppm			
Lower Basin	3140	Silverton	3390
Kingston	1750	Wallace	29725
Side Gulches	3929	Burke/Ninemile	5800
Osburn	2192	Mullan	4060

NOTE: Data from Human Health Risk Assessment, TerraGraphics Environmental Engineering, 2000.

Figure 4.2-2
Lead Levels in House Dust

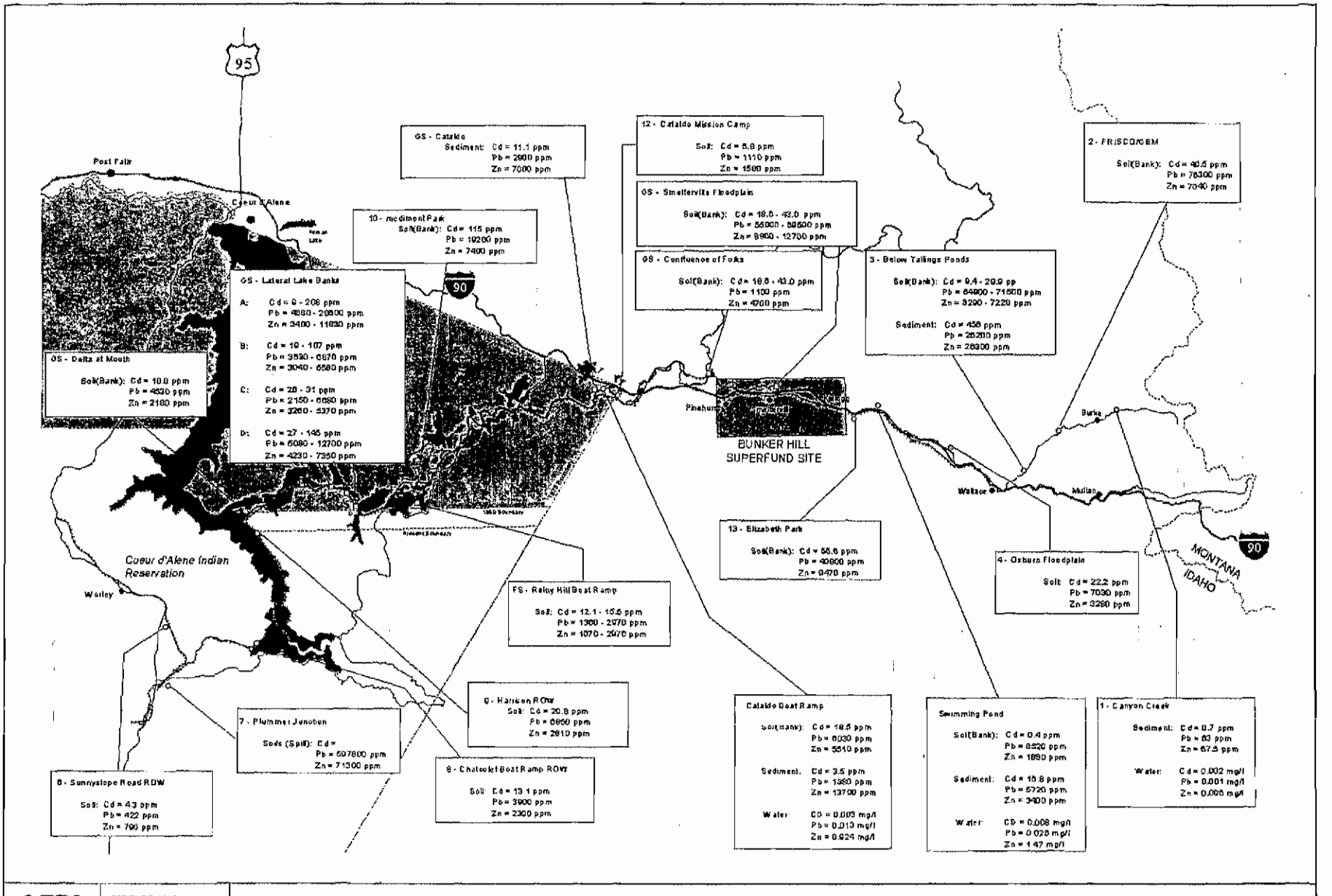


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Figure 4.2-3
Coeur d'Alene Basin Soil & Water Sampling Map

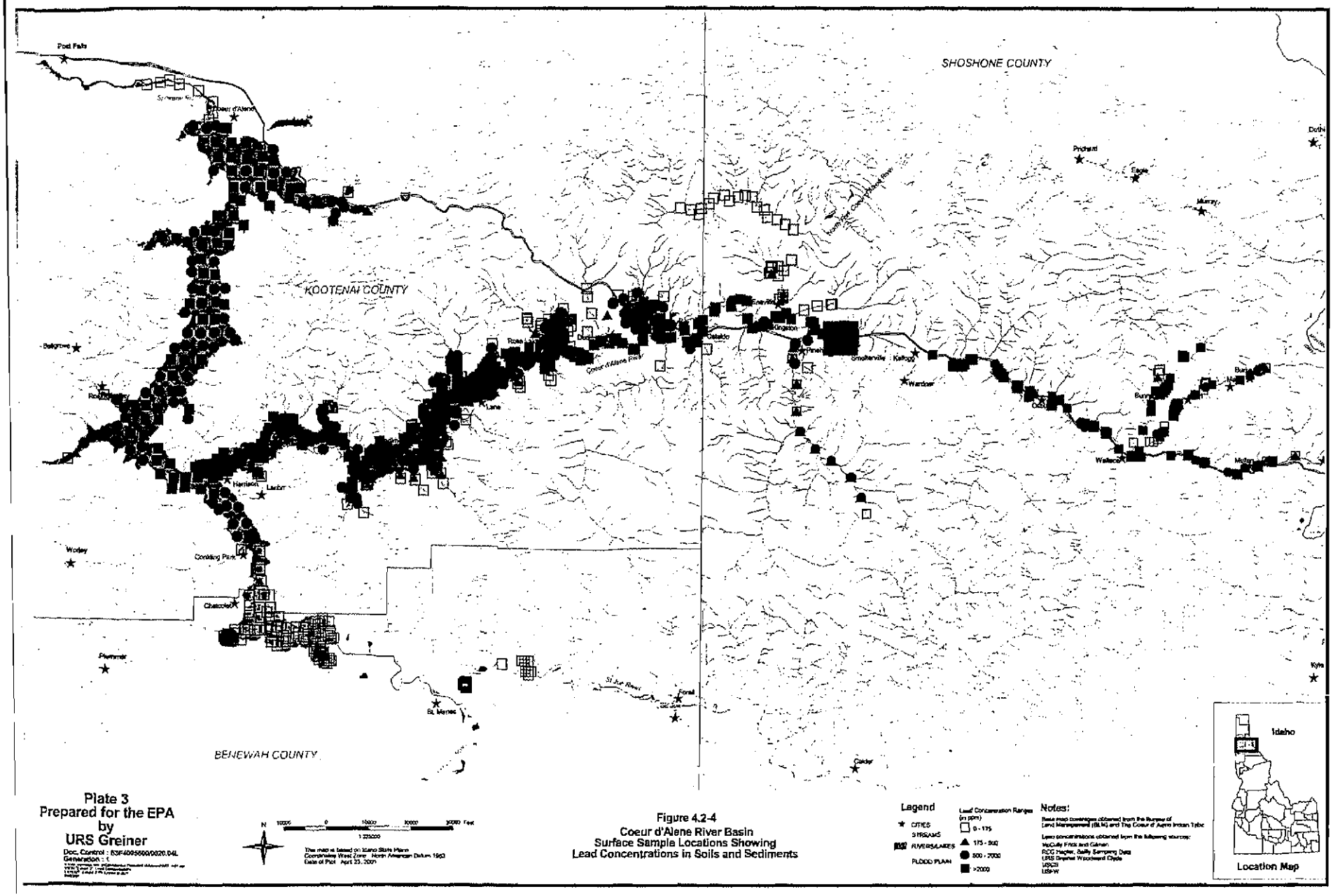
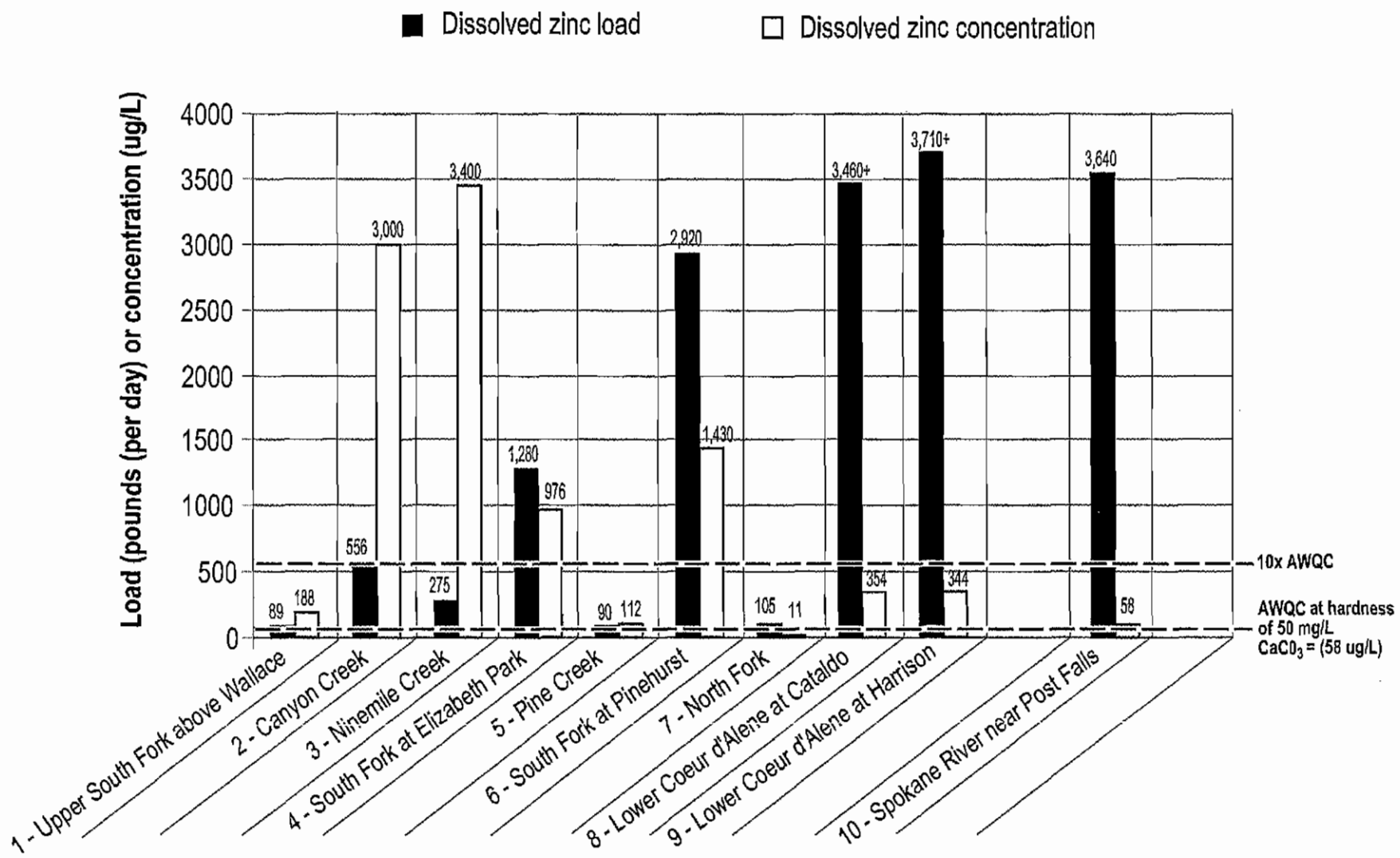


Plate 3
Prepared for the EPA
by
URS Greiner

Doc. Control : 63F40055600/0020.04L
Generation : 1

Figure 4.2-4
Coeur d'Alene River Basin
Surface Sample Locations Showing
Lead Concentrations in Soils and Sediments



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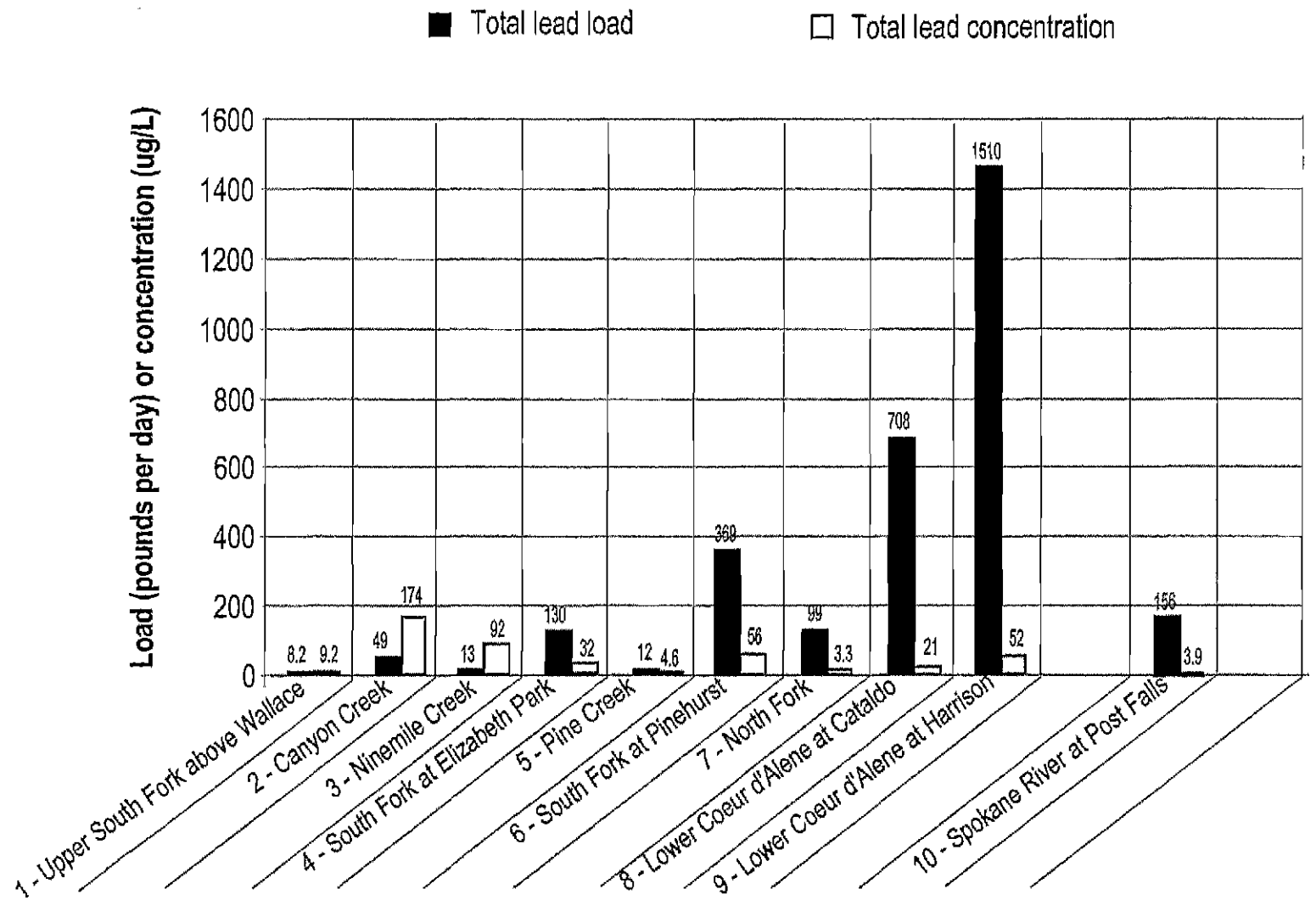
Generation: 1

RRB4

Figure 4.2-5
Estimated Average Values of Dissolved Zinc Loads and Concentrations (1991-1999 Data)



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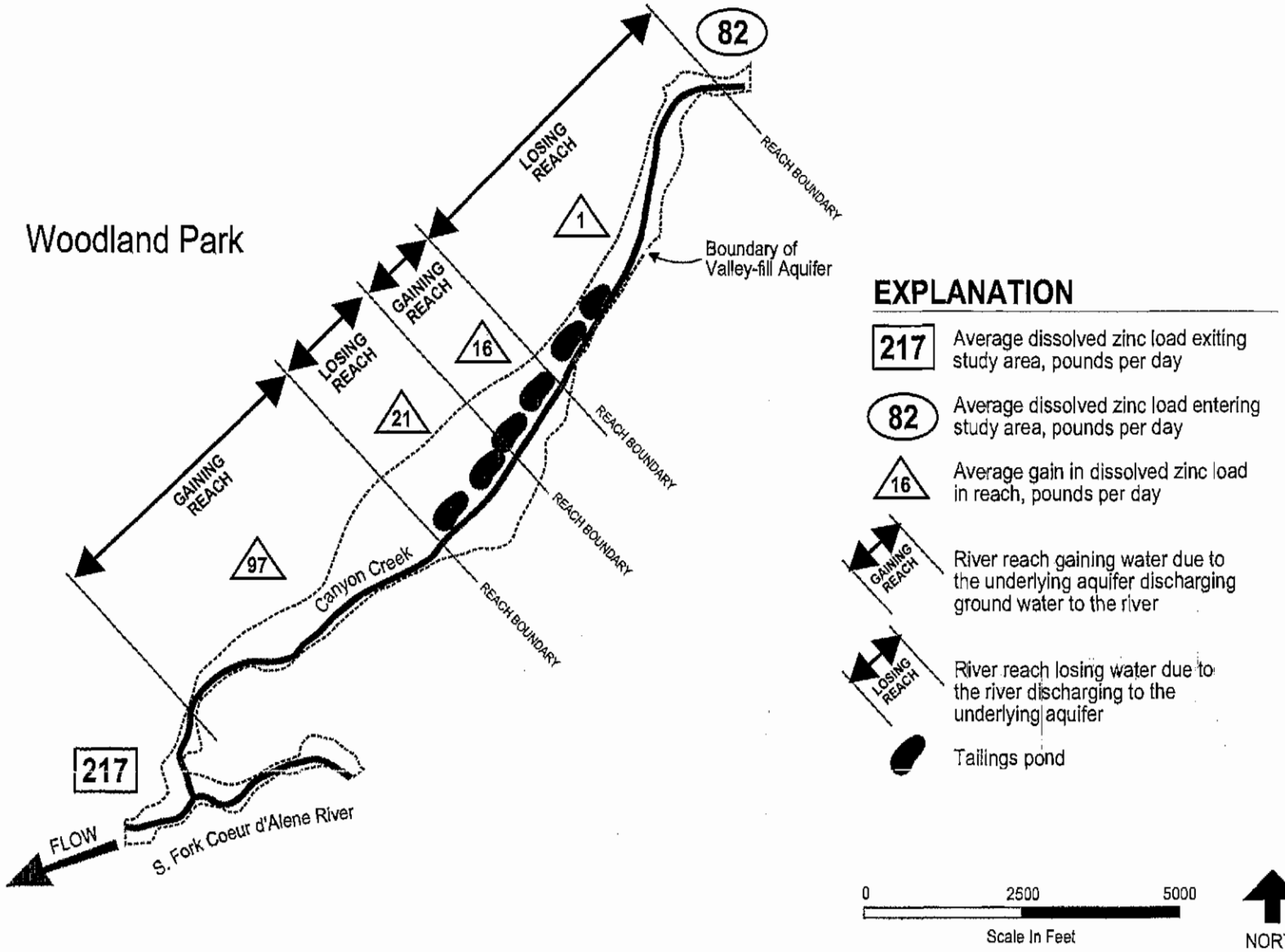
Doc. Control: 4162500 06864.05a
Generation: 1

RRB5

Figure 4.2-6
Estimated Average Values of Total Lead Loads and Concentrations (1991-1999 Data)



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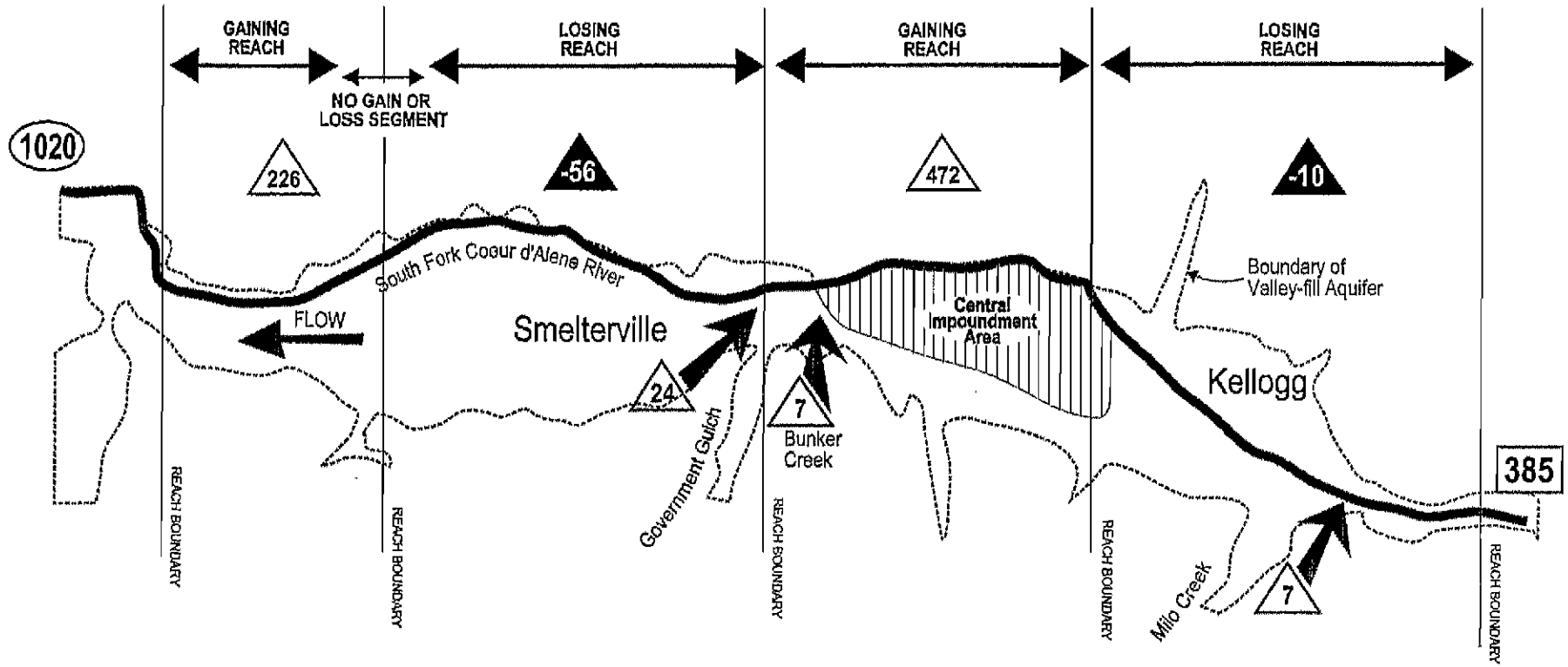
RRB7

Figure 4.2-7
Dissolved Zinc Loads in Canyon Creek at Woodland Park, September 17, 18, and 19, 1999



EXPLANATION

385	Average dissolved zinc load entering study area, pounds per day
1020	Average dissolved zinc load exiting study area, pounds per day
16	Average gain in dissolved zinc load in reach, pounds per day
-16	Average loss in dissolved zinc load in reach, pounds per day
GAINING REACH	River reach gaining water due to the underlying aquifer discharging ground water to the river
LOSING REACH	River reach losing water due to the river discharging to the underlying aquifer

0 5000
Scale in Feet

NORTH

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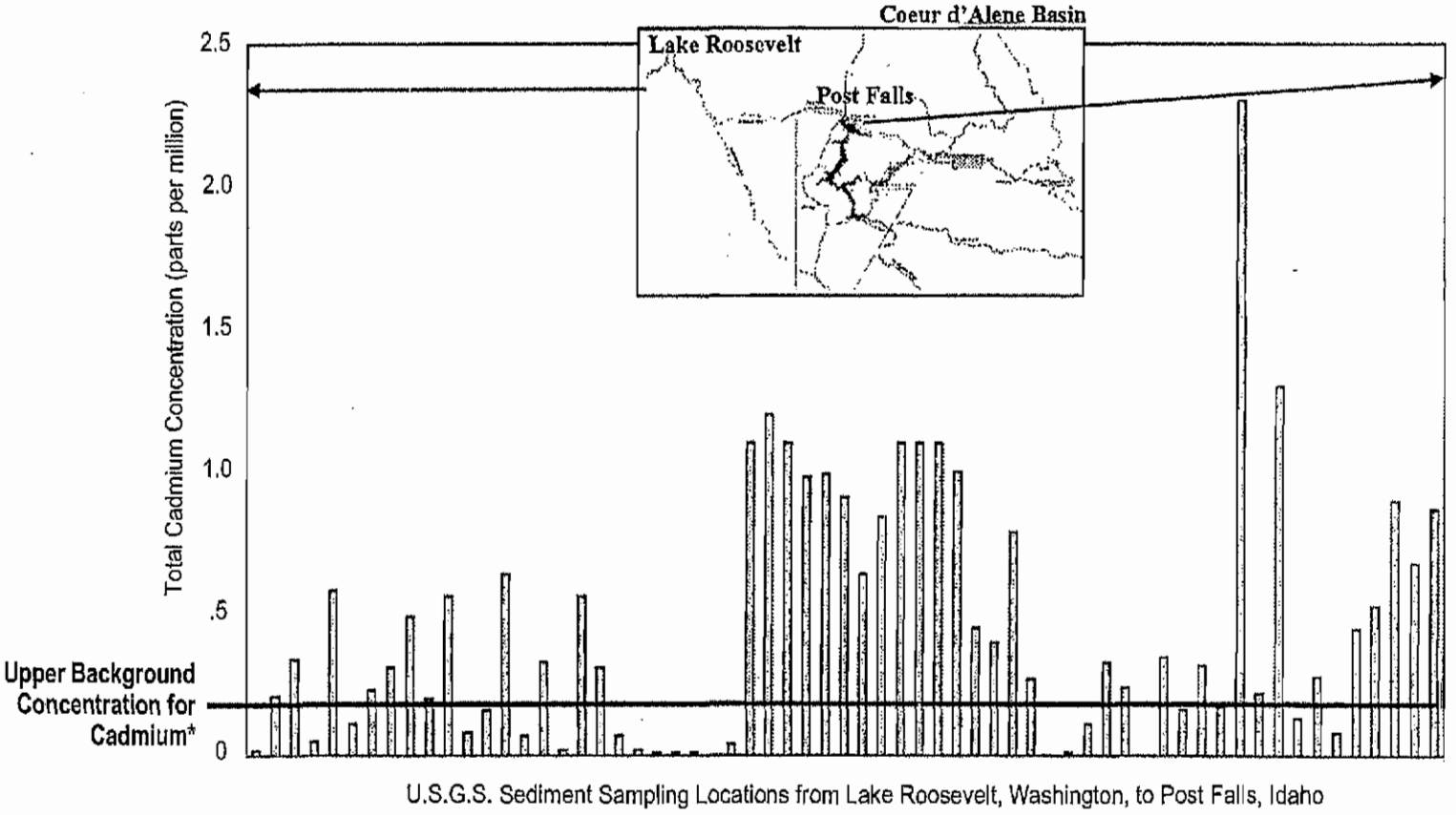
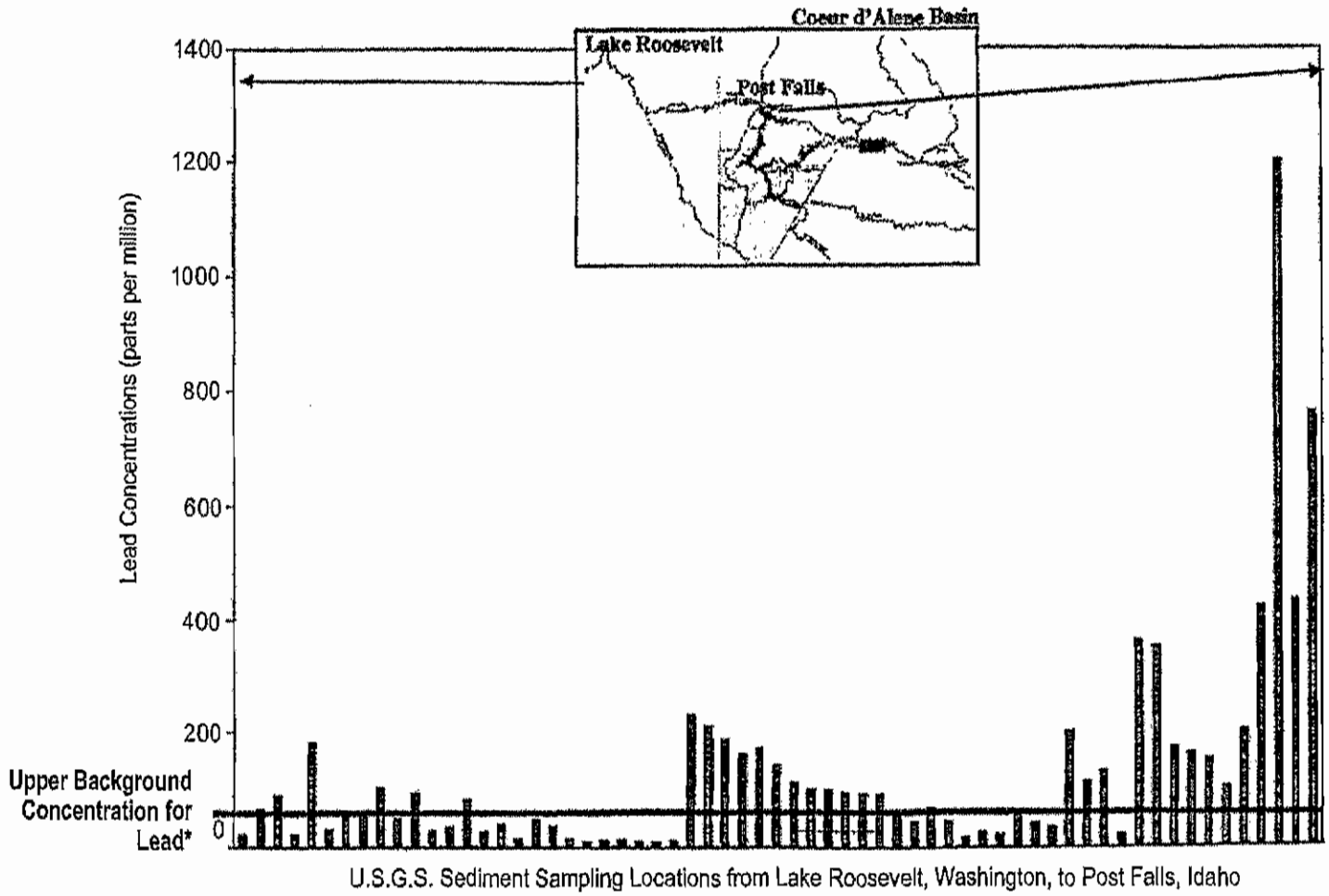
RRB3

Figure 4.2-8
Dissolved Zinc Loads in the South Fork Coeur d'Alene River near Kellogg and Smelterville, September 17, 18, and 19,1999



*Source: URS. Final Technical Memorandum (Rev.2) Estimation of Background Concentrations in Soil, Sediment, and Surface Water in the Coeur d'Alene and Spokane River Basins, June 2001.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 RRB9	**Figure 4.2-9** **Total Cadmium Concentrations in Spokane River Sediments**



*Source: URS. Final Technical Memorandum (Rev.2) Estimation of Background Concentrations in Soil, Sediment, and Surface Water in the Coeur d'Alene and Spokane River Basins, June 2001.

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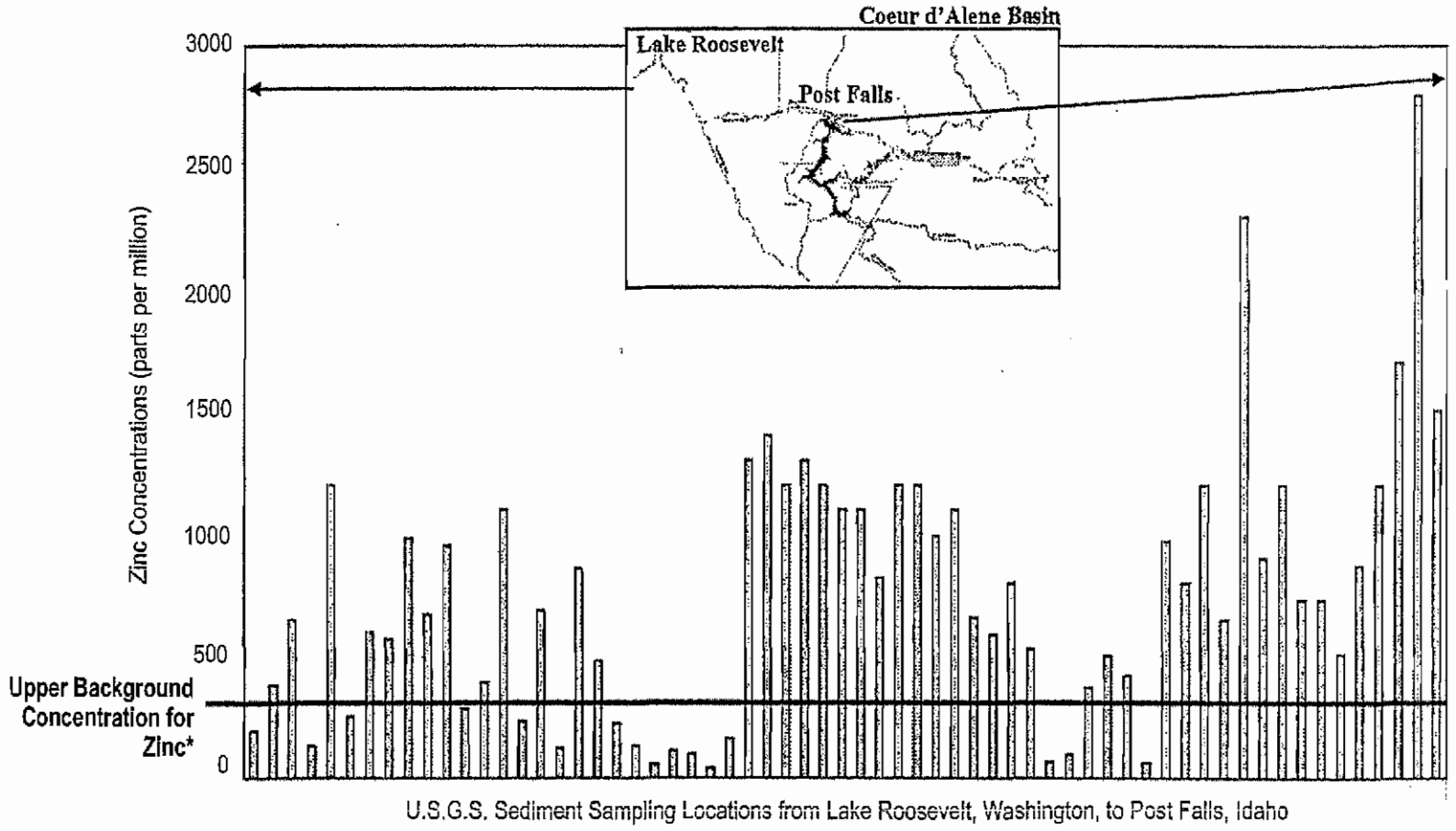
Doc. Control: 4162500.06884 05a
Generation: 1

RRB10a

Figure 4.2-10
Total Lead Concentrations in Spokane River Sediments



*Source: URS. Final Technical Memorandum (Rev.2) Estimation of Background Concentrations in Soil, Sediment, and Surface Water in the Coeur d'Alene and Spokane River Basins, June 2001.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06654.05a Generation: 1 RRB10	Figure 4.2-11 Total Zinc Concentrations in Spokane River Sediments

Table 4.2-1
Estimated Number of Residential Yards Needing Remediation for Protection of Human Health

Community	Estimated Total Residential Yards[a]	Estimated Percentage of Yards Needing Remediation[b]		Estimated Number of Yards Needing Remediation[c]	
PRGs	--	700 ppm	1,000 ppm	700 ppm	1,000 ppm
Mullan	548	46	33	252	181
Wallace	649	61	39	396	253
Burke/Ninemile					
Canyon Creek	173	59.5	45	103	78
Ninemile Creek	72	59.5	45	43	32
Silverton	360	19.5	10	70	36
Osburn	847	23.5	12.4	199	105
Side Gulches	624	21	8	131	50
Kingston	1,006	15.5	13	156	131
Lower Basin	1,642	13	13	213	213
Total	5,921	26.4	18.2	1,563	1,079

[a] Total number of yards estimated on the basis of the total yards for conceptual site model units reported in Table 3-18 of the Draft Human Health Risk Assessment (see Appendix B). The total number of residential yards in CSM unit Burke/Ninemile were prorated to Ninemile Creek and Canyon Creek on the basis of field reconnaissance by CH2M HILL (70.6 percent for Canyon Creek; 29.4 percent for Ninemile Creek).

[b] For 1,000 ppm PRGs, the percentage of yards needing remediation was estimated on the basis of the percentage of yards exceeding 1,000 ppm lead in Tables 6-11a – 6-11j of the Draft Human Health Risk Assessment; for the 700 ppm PRG, the percentage of yards needing remediation was estimated on the basis of the average of the percentage of homes remediated as listed in Tables 6-62d and 6-62e of the Draft Human Health Risk Assessment.

[c] Estimated by multiplying the estimated total number of yards by the estimated percentage of yards needing remediation.

Table 4.2-2
Estimated Number of Residences with Drinking Water MCL Exceedances

Area of Investigation	Number of Residences[a]	Assumed Number of Private, Unregulated Sources[b]	Estimated Frequency of MCL Exceedances[c]	Estimated Number of Residences with MCL Exceedances[d]	Nearest Water District	Inside/Outside Nearest Water District	Assumed Maximum Distance to Utility Tie-in[e] (miles)	Availability of Suitable Alternative Aquifer[f]	Assumed Number of Wells to Abandon[g]
Upper Basin									
Mullan	553	20	3%	1	East Shoshone County Water District	Inside	100 feet	Low-none	1
Burke/Ninemile	265								
Ninemile Creek Communities	NE								
McCarthy	NE	60	3%	2	East Shoshone County Water District	Outside	1	Low-none	2
Day Rock	NE	3	3%	0	East Shoshone County Water District	Outside	0.5	Low-none	0
BlackCloud	NE	25	3%	1	East Shoshone County Water District	Outside	0.9	Low-none	1
Zanettiville	NE	10	3%	0	East Shoshone County Water District	Outside	1.5	Low-none	0
Canyon Creek Communities	NE								
Woodland Park	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0
Gem	NE	40	3%	1	East Shoshone County Water District	Outside	2.25	Low-none	1
Frisco	NE	5	3%	0	East Shoshone County Water District	Outside	0.3	Low-none	0
Black Bear	NE	10	3%	0	East Shoshone County Water District	Outside	0.1	Low-none	0
Yellow Dog	NE	5	3%	0	East Shoshone County Water District	Outside	0.5	Low-none	0
Cornwall	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0
Mace	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0

Table 4.2-2 (Continued)
Estimated Number of Residences with Drinking Water MCL Exceedances

Area of Investigation	Number of Residences[a]	Assumed Number of Private, Unregulated Sources[b]	Estimated Frequency of MCL Exceedances[c]	Estimated Number of Residences with MCL Exceedances[d]	Nearest Water District	Inside/Outside Nearest Water District	Assumed Maximum Distance to Utility Tie-in[e] (miles)	Availability of Suitable Alternative Aquifer	Assumed Number of Wells to Abandon[f]
Upper Basin (Continued)									
Burke	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low	0
Wallace	767	10	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0
Silverton	376	20	3%	1	East Shoshone County Water District	Inside	100 feet	Low-none	1
Osburn	1026	40	3%	1	Central Shoshone County Water District	Inside	100 feet	none[g]	1
Side Gulches	640								
Nuckols Gulch	NE	50	3%	2	Central Shoshone County Water District	Outside	1	Low-none	2
Twomile Creek	NE	50	3%	2	Central Shoshone County Water District	Outside	2	Low-none	2
Sunny Slopes	NE	10	3%	0	Central Shoshone County Water District	Inside	100 feet	Low-none	0
Terror Gulch	NE	30	3%	1	Central Shoshone County Water District	Outside	2	Low-none	1
Big Creek	NE	0	3%	0	Central Shoshone County Water District	Inside	100 feet	Low-none	0
Moon Gulch	NE	60	3%	2	Central Shoshone County Water District	Outside	3	Low-none	2
Montgomery Gulch	NE	0	3%	0	Central Shoshone County Water District	Inside	100 feet	Low-none	0
Kingston	1006	768	10%	77	Kingston Water District	238 connections[h]	NE[i]	Medium	77
Pine Creek (above BHSS to Bear Creek)	30	15	10%	2	Pinehurst Water District	Inside	100 feet	Low	2

Table 4.2-2 (Continued)
Estimated Number of Residences with Drinking Water MCL Exceedances

Area of Investigation	Number of Residences[a]	Assumed Number of Private, Unregulated Sources[b]	Estimated Frequency of MCL Exceedances[c]	Estimated Number of Residences with MCL Exceedances[d]	Nearest Water District	Inside/Outside Nearest Water District	Assumed Maximum Distance to Utility Tie-in[e] (miles)	Availability of Suitable Alternative Aquifer	Assumed Number of Wells to Abandon[f]
Lower Basin									
Cataldo	1642	400	10%	40	Cataldo Water District	Assume partial service	NE[i]	Medium	40
Harrison		400	10%	40	Harrison Water District	Assume partial service	NE[i]	High	40

Notes:
[a] Based on site reconnaissance and demographic data from the human health risk assessment (TerraGraphics and URSG 2000).
[b] Assumes 100 percent of residences outside water district service boundaries have private, unregulated sources.
[c] See Table 4-6 of the FS Part 2 (CH2M HILL 2000) for actual observed MCL exceedances. Lower basin value applied to Kingston area because of small Kingston data set.
[d] See text for basis.
[e] Areas within municipal water district service boundaries are assumed to be less than or equal to 100 feet from a utility tie-in. Values for Ninemile and Canyon Creek areas outside water districts are incremental from nearest downgradient neighbor.
[f] Assumes 50 percent of private, unregulated sources in rural areas are water wells and 50 percent are springs. In-town numbers based on consultation with local water district.
[g] Osburn has a moratorium on new well construction.
[h] Based on IDEQ 1999 annual survey of public water systems, the Kingston Water District #1 serves 238 connections.
[i] Too little is known about the small water systems in Kingston Water District and lower basin water districts to provide a meaningful estimate.
[j] More information pending from EPA-initiated voluntary drinking water program.
NE = Not Estimated

Table 4.2-3
Residences Exceeding Lead Concentration Thresholds for House Dust

Consideration	Area of Investigation							
	Lower Basin	Kingston	Side Gulches	Ninemile	Mullan	Osburn	Silverton	Wallace
Number of housing units per area 1999[a]	1642	1006	640	265	553	1026	376	767
Number of vacuum bag samples[b]	31	30	26	35	32	84	26	35
Number of Housing Units Exceeding Lead Concentration Thresholds								
>500 mg/kg lead	575	503	442	183	520	616	233	683
>1,500 mg/kg lead	94	29	122	81	131	19	43	109

[a]Values from Table 3-18 of the human health risk assessment (TerraGraphics and URSG 2000) and developed from 1990 census and 1999 sewer district data. Lower basin data not available for 1999 so value shown is solely from 1990 census data.
[b]Assumed to represent entire area of investigation.

Table 4.2-4
Summary of Basin Ecological Source Quantities

Source Type	Units	Quantity
Upper Basin		
Floodplain Sediments[a]	cy	7,100,000
Tailings[b]	cy	11,000,000
Waste Rock[c]	cy	11,700,000
Adit Drainage[d]	#Zn/d	101
Lower Basin		
Riverbed Sediments[e]	cy	17,600,000
Bank Wedges[e]	cy	1,780,000
Wetland Sediments[e]	cy	5,900,000
Lateral Lake Sediments[e]	cy	5,900,000
Floodplain Sediments[e]	cy	10,200,000
Cataldo/Mission Flats Dredge Spoils	cy	13,600,000
Coeur d'Alene Lake		
Lake Bottom Sediments	metric tons	75,000,000
Spokane River[f]	cy	260,000

[a]Impacted sediment present in the current and historic 100-year floodplain. Total volume does not include either less impacted, generally deeper and more dispersed sediments that are potential source of zinc loading or impacted materials within fills or embankments (e.g., I-90 and UPRR rights-of-way); these additional sediment volumes may be as high as approximately 20,000,000 cy.
[b]Tailings volumes include unimpounded tailings and impounded tailings in both inactive and active facilities.
[c]Waste rock volumes include waste rock in floodplains and uplands, as well as waste rock at active facilities.
[d]Data used to calculate average zinc loading are available for only 53 of 114 discharging adits in the upper basin. Although data are available for the largest loaders, the cumulative average zinc load from all discharging adits may exceed the amount shown in this table.
[e]Volumes estimates for all impacted media in the lower basin, CSM Unit 3, are based on lead concentrations exceeding 1,000 mg/kg. Additional volumes of impacted sediments that are potential sources of zinc loading are not included in these estimates.
[f]Contaminated sediments upstream of Upriver Dam. Additional contaminated sediments are present downstream of Upriver Dam, but have not been quantified.

Notes:
This is a condensed summary with approximate quantities--for a detailed accounting of sources and remedial actions see the FS Part 3, Sections 5 and 6 and appendices as referenced therein (URSG and CH2M HILL 2000c).
Quantities of source materials within the BHSS are not included in this table.
cy - cubic yards
#Zn/d - pounds of zinc per day

Table 4.2-5
Metals Loads and Retention in Coeur d'Alene Lake

Parameter	1994 (low discharge)	1995 (average discharge)	1997 (high discharge)	1999 (120% of average discharge)
Annual mean discharge (cfs)	2,970	6,300	10,300	7,530
Zinc				
Total Inflow (kg)	460,000	880,000	1,400,000	1,570,000
Total Outflow (kg)	260,000	580,000	860,000	1,080,000
%Retained	43	35	41	31
Lead				
Total Inflow (kg)	88,000	470,000	1,300,000	590,000
Total Outflow (kg)	16,000	37,000	100,000	51,300
%Retained	82	92	92	91
Cadmium				
Total Inflow (kg)	3,800	7,200	11,000	10,400
Total Outflow (kg)	1,700	3,600	5,800	4,940
%Retained	56	51	47	53

Note: Refers to whole-water recoverable metals loads

5.0 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

5.1 CURRENT LAND USE

Site land uses include residential, recreational, agricultural, and light urbanization or industrialization. Human habitation is primarily concentrated in communities along the South Fork Coeur d'Alene River and population centers in the cities of Coeur d'Alene and Post Falls, Idaho, and Spokane, Washington. The Basin is the ancestral home of the Coeur d'Alene Tribe. Coeur d'Alene Tribe lands are present in the Lower Basin. Spokane Tribe lands are present along the lower Spokane River in the state of Washington.

Most of the site is undeveloped and includes large areas of federal and state land. Undeveloped areas include upland forest habitats and lowland floodplains with riverine, riparian, wetland, and lake habitats. The quality of these habitats and their ability to support natural populations of flora and fauna has been impacted to varying degrees by historic mining activity in the basin.

The majority of the population of the Basin lives in the cities of Coeur d'Alene and Post Falls, which have populations exceeding 10,000 people. All other communities in the Basin have populations less than 6,500. In both Kootenai and Shoshone counties, over 38 percent of the total population live in rural areas outside of these two major cities. The total population of the area addressed by the human health alternatives is approximately 10,500.

A number of indicators show depressed socio-economic conditions are present in the Basin compared to statewide conditions, including:

- Higher unemployment
- Higher percentages of persons living below the poverty level
- Lower rates of high school and college graduation
- Higher per capita welfare payments

The socio-economic status of families has been noted to be a significant factor affecting children's blood lead levels in numerous studies (Pirkle et al. 1998, Brody et al. 1994, Clark et al. 1985, Bornschein et al. 1985). In the Basin, young children often have limited places to play, and when not at their home are often found on commercial properties.
In addition to residential, developed land use includes commercial, light industrial, and agriculture. The I-90 freeway parallels the river from Cataldo east to the Idaho-Montana border. A railroad right-of-way parallels the entire length of the river as well as the lake. It is currently being converted to a trail system.

Much of the Coeur d'Alene Basin consists of rural, undeveloped land. Approximately 32 percent of Kootenai County and 75 percent of Shoshone County is federally managed land, primarily National Forest. These undeveloped lands and the numerous streams in the Basin provide abundant recreation opportunities. Figure 5.1-1 and 5.1-2 show private and public land ownership in the Upper Basin.

5.2 ANTICIPATED FUTURE LAND USES

It is anticipated that future land use will be similar to current or reasonable foreseeable future land use. Although population levels in the Basin have declined in recent years, the City of Coeur d'Alene has experienced substantial population growth, and it is possible that population growth could expand into the Basin. In this case, areas of the Lower Basin floodplains that are currently undeveloped or used for agriculture could be developed for residential use. Increased recreational use of beaches may occur as a result of several factors: (1) increasing tourism in the Basin; (2) easier access due to the conversion of the Union Pacific Railroad Right-of-Way, which parallels the river, into a trail; and (3) potential increased population.

The Tribes are concerned with protection of subsistence lifestyles. Individuals practicing a subsistence lifestyle would potentially have substantially larger exposures to metals in soil, sediment, water, native vegetables, and fish caught in the Basin than individuals practicing non-subsistence lifestyles. Current levels of contamination preclude the use of historic tribal resources and the practice of a subsistence lifestyle by individuals who would choose to do so.

5.3 GROUNDWATER AND SURFACE WATER USES

The state of Idaho has identified designated beneficial uses for the surface water of the Idaho portion of the Basin. The designated uses generally reflect current surface water uses, with some exceptions where the designated uses are not currently attained. For example, Ninemile Creek, from and including East Fork Ninemile Creek to its mouth, is designated for coldwater aquatic life and salmonid spawning. These uses are not currently attained in Ninemile Creek downstream of mining impacts. Similarly, coldwater aquatic life is not attained in Canyon Creek downstream of mining impacts. The use designations do not reflect pre-mining use and condition of the stream, nor are they intended to reflect remediation goals. The designated uses and areas of current non-attainment are presented in Table 5.3-1.

Groundwater and surface water are used as drinking water sources in the Basin. Within the Basin, about 57 percent of residences obtain water from a public source and 43 percent obtain water from a private source. Table 5.3-2 describes the public drinking water systems in the Basin, and Table 5.3-3 shows the estimated number of residences using private drinking water sources within the human health alternatives study area.

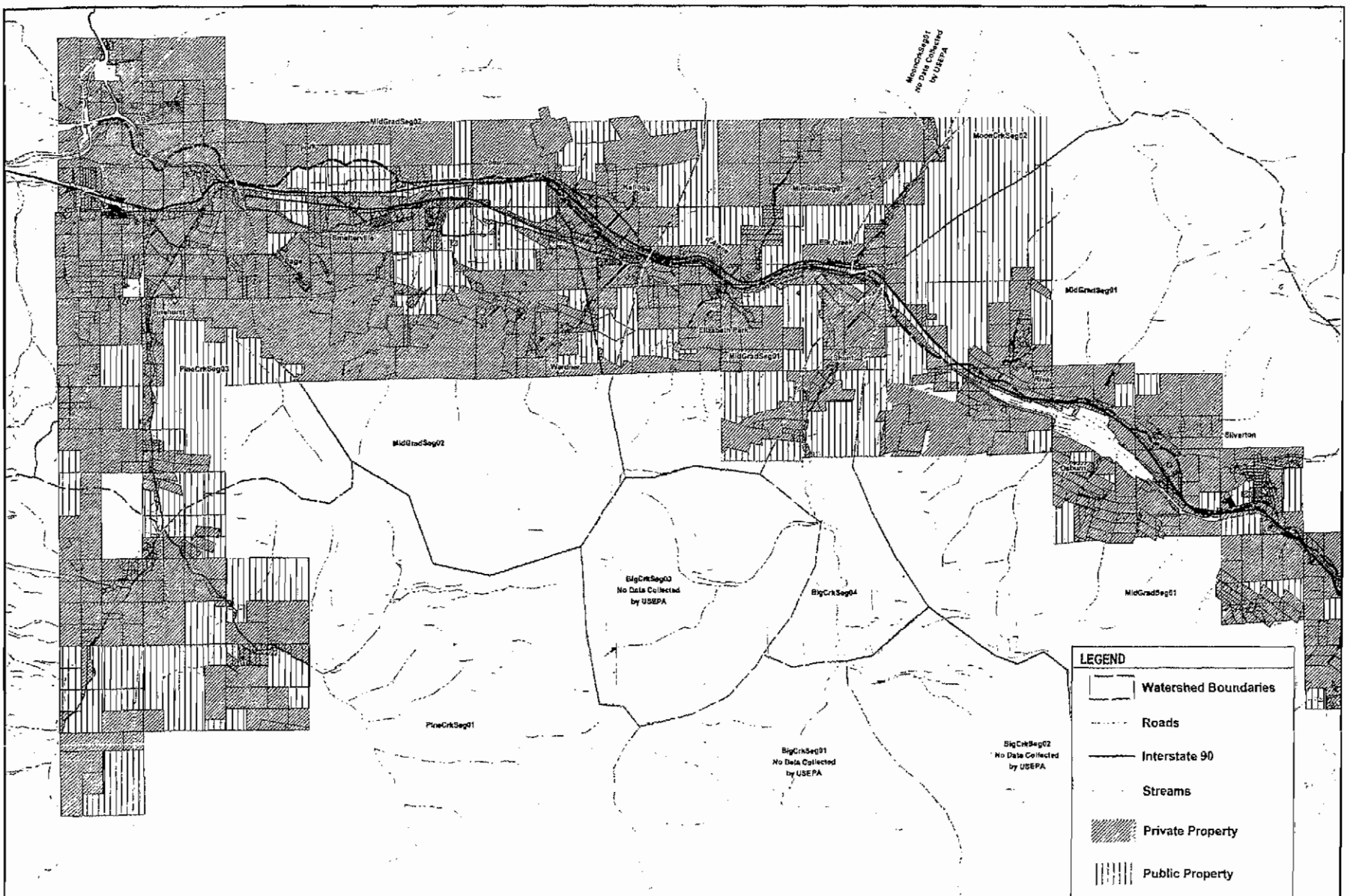


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Figure 5.1-1
Public and Private Land Ownership in the South Fork Coeur d'Alene Basin

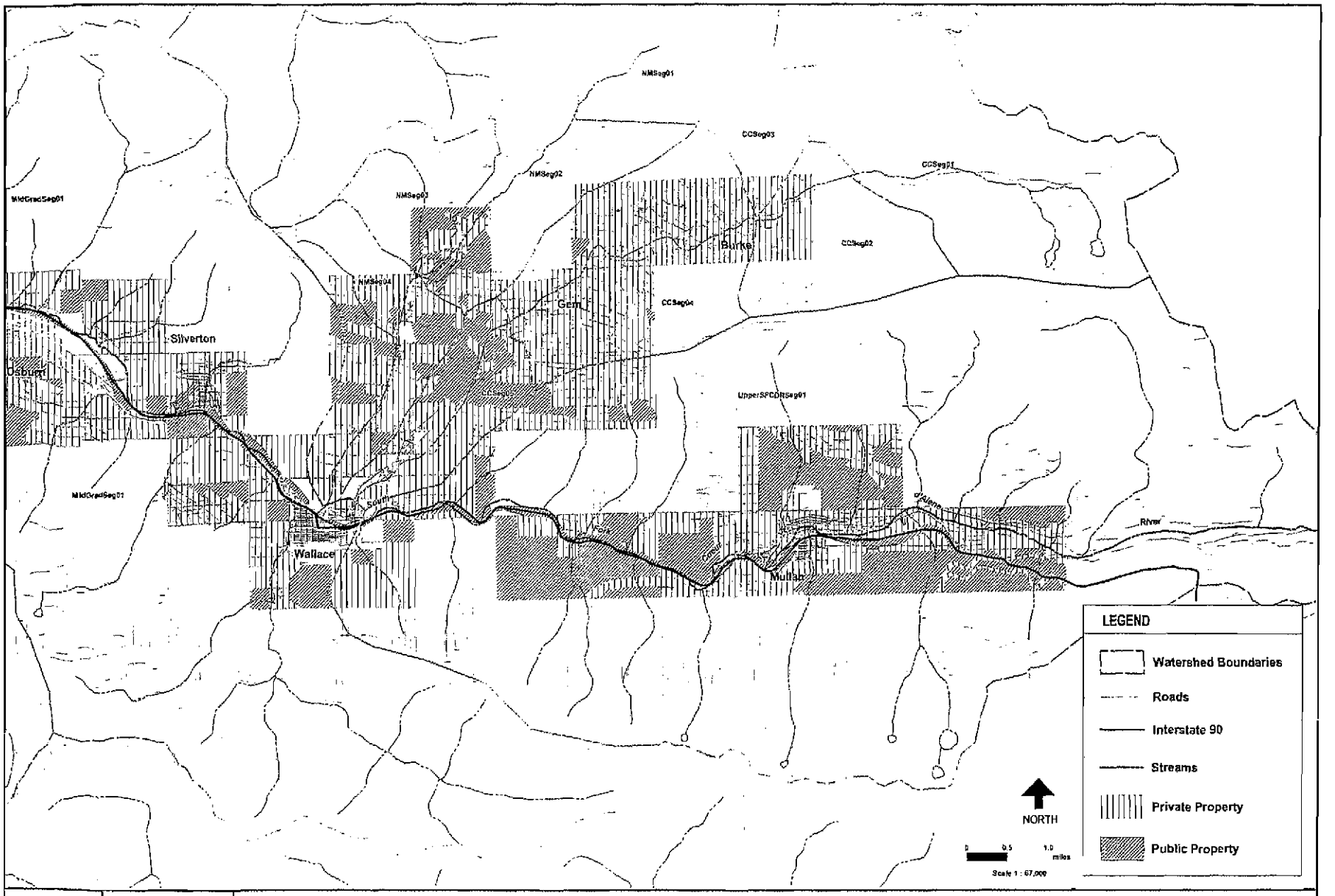

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Figure 5.1-2
Public and Private Land Ownership in the South Fork Coeur d'Alene Basin

Table 5.3-1
Surface Water Designated Beneficial Uses

Waters	Aquatic Life	Recreation	Other
South Fork Coeur d'Alene River - Canyon Creek to mouth		SCR	
Pine Creek - East Fork Pine Creek to mouth	**COLD; SS**	SCR	
Pine Creek - source to East Fork Pine Creek	COLD; SS	PCR	DWS
East Fork Pine Creek - source to mouth	**COLD; SS**		
Government Gulch - source to mouth	***COLD; SS***	SCR	
Big Creek - source to mining impact area	COLD; SS	PCR	DWS
Big Creek - mining impact area to north	COLD; SS	SCR	
Shields Gulch - source to mining impact area	COLD; SS	PCR	DWS
Shields Gulch - mining impact area to mouth		SCR	
Lake Creek - source to mining impact area	COLD; SS	PCR	DWS
Lake Creek - mining impact area to mouth	**COLD; SS**	SCR	
Placer Creek - source to mouth[a]	COLD		
South Fork Coeur d'Alene River - from and including Daisy Gulch to Canyon Creek	COLD	SCR	
Willow Creek - source to mouth[a]			
South Fork Coeur d'Alene River - source to Daisy Gulch	COLD; SS	PCR	DWS
Canyon Creek - from and including Gorge Gulch to mouth	***COLD***	SCR	
Canyon Creek - source to Gorge Gulch	COLD; SS	PCR	DWS
Ninemile Creek - from and including East Fork Ninemile Creek to mouth	**COLD; SS**	SCR	
Ninemile Creek - source to East Fork Ninemile Creek	COLD; SS	PCR	DWS
Moon Creek - source to mouth[a]			
West Fork Moon Creek - source to mouth[a]			
Bear Creek - source to mouth	COLD; SS	PCR	DWS
Coeur d'Alene Lake	COLD; SS	PCR	DWS SRW
Coeur d'Alene River - South Fork Coeur d'Alene River to mouth	**COLD**	PCR	

[a] These waters, although undesignated, are protected for coldwater aquatic life, primary contract recreation, and secondary contact recreation (IDAPA 16.01.02, Section 101–Undesginated Uses)
BOLD indicates use is partially supported
BOLD ITALICS indicates use is not supported
Notes:
All waters are designated for agricultural and industrial water supply, wildlife habitat, and aesthetics.
COLD = Coldwater aquatic life
DWS = Drinking water supply
PCR = Primary contact recreation
SCR = Secondary contact recreation
SRW = Special resource water
SS = Salmonid spawning

Table 5.3-2
Coeur d'Alene River Basin Public Drinking Water Systems

Type of System	Water Source	Population	Connections	Comments
Community public water system	Wells	4490	1875	
	Surface water	7013	3446	Central Shoshone Water District (population=4052, connections=2293) is temporarily using surface water while well undergoes corrosivity evaluation.
	Unknown	574	226	
Non-community transient public water system	Wells	385	120	
	Unknown	500	1	
Non-transient, non-community public water system	Wells	445	2	
	Surface water	490	13	
	Unknown	170	2	

Table 5.3-3
Estimated Number of Residences with Private, Unregulated Drinking Water Sources

Area of Investigation	Number of Residences[a]	Number of Residences within Water District	Estimated Number of Private, Unregulated Sources[b]	Nearest Water District	Availability of Suitable Alternative Aquifer
Upper Basin					
Mullan	553	533	20	East Shoshone County Water District	Low-none
Burke/Ninemile	265	107	158	East Shoshone County Water District	Low-none
Wallace	767	757	10	East Shoshone County Water District	Low-none
Silverton	376	356	20	East Shoshone County Water District	Low-none
Osburn	1026	986	40	Central Shoshone County Water District	none[c]
Side Gulches	640	440	200	Central Shoshone County Water District	Low-none
Kingston	1006	238	768	Kingston Water District	Medium
Pine Creek (above BHSS to Bear Creek)	30	15	15	Pinehurst Water District	Low
Lower Basin					
Cataldo	1642	842	400	Cataldo Water District	Medium
Harrison			400	Harrison Water District	High

Notes:
[a]Based on site reconnaissance and demographic data from the human health risk assessment (TerraGraphics and URSG 2000).
[b]Assumes 100 percent of residences outside water district service boundaries have private, unregulated sources.
[c]Osburn has a moratorium on new well construction.
NE = Not Estimated

6.0 SUMMARY OF RISKS

6.1 HUMAN HEALTH RISKS

Mining-related metals contamination in the basin has led to concerns about its effect on human health. As a result, numerous studies have been conducted in the basin by federal, state, and local agencies. These studies, along with the health-related programs currently conducted in the basin, are summarized below.

6.1.1 Basin-Wide Health Responses and Related Activities

In addition to the studies and mitigation responses conducted at the Bunker Hill area, several other human health studies that expanded into the larger basin area have been conducted in the past decade. These human health studies include:

- A residential sampling effort undertaken in the summer of 1996 by the Idaho Department of Health and Welfare (IDHW 2000)
- Two health consultations by the Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1998, 2000)
- Several Panhandle Health District (PHD) lead health surveys (Van Lindern 2000a; PHD 1992, 1997)
- Four residential EPA surveys conducted as part of the current basin-wide RI/FS under field sampling plan addenda FSPA06, FSPA07, FSPA12, and FSPA16 (URSG and CH2M HILL 1998, 1999a, 1999b, and 2000d)
- Sampling of school yards and daycare facilities conducted to support the human health risk assessment/removal actions under field sampling plan addendum FSPA13 (URSG and CH2M HILL 1999c)
- Multiple special studies conducted for the Natural Resource Damage Assessment (NRDA)

The IDHW study characterized environmental contamination and biological indices from 843 homes in the basin. The three EPA studies sampled 123 homes in the basin, and collected additional voluntary self-identified information over the past three years. IDHW and PHD in the upper and lower basin have provided fixed-site blood lead screening over the last 3 years.

6.1.2 Ongoing Basin-Wide Human Health Programs

Two programs that address human health issues are currently being conducted in the Basin. The first is the Lead Health Intervention Program run by the PHD. This program provides personal health and hygiene information to help mitigate exposure to contaminants. Services include educational programs, health monitoring programs, yard and home sampling, and nursing follow-up services.

The second ongoing program is the Institutional Controls Program (ICP) currently conducted in the BHSS, also run by the PHD. The ICP ensures that remedial technologies retain their integrity and effectiveness and are not compromised by future actions. To ensure the effectiveness of alternatives enacted throughout the basin, the ICP would be expanded to become a basin-wide program that would also see that future actions do not create new human health risks. The basin-wide ICP would include records maintenance, permitting, surveillance, inspections, and local construction regulations developed and implemented in conjunction with local zoning, building, or planning commissions.

Future uses of undeveloped areas would likely be addressed by local ordinance as part of the ICP. For drinking water, expansion of the BHSS "area of drilling concern" would advise drillers of the nonpotable nature of the main valley aquifer and of source area side gulches. For commercial and residential development, permitting would ensure that a local entity could evaluate the area for development and require standardized measures to prevent exposure to contaminants. This approach has been greatly successful as implemented by the PHD in Kellogg, Smelterville, Page, and Pinehurst.

The "information and intervention" components of the human health alternatives include both the Lead Health Intervention Program and the Institutional Controls Program.

6.1.3 Summary of Blood Lead Screening Surveys

Numerous blood lead screening surveys have been conducted in the basin, and specifically within the BHSS to evaluate the level of lead in residents' blood. The United States Centers for Disease Control (CDC) has determined that blood lead levels greater than 10 micrograms per deciliter (µg/dL) present an undue risk of damaging health effects (CDC 1991, 1997). For guidance, the CDC has developed the following general policies and activities related to lead poisoning prevention.

- Lead levels less than 10 µg/dL require no additional action unless exposure sources change. Recommend rescreening in 1 year.
- Lead levels in the 10-14 µg/dL range indicate exposure in a community. Recommend family lead education and follow-up testing.

- Levels of 15-19 µg/dL indicate lead adsorption and require educational and nutritional intervention and more frequent screening.
- Levels of 20-44 µg/dL require medical and environmental intervention and perhaps chelation.
- Levels of 45 µg/dL or higher require environmental and medical intervention with chelation therapy.

Blood lead levels have been monitored in the populated areas of the BHSS since 1974. The available data are presented chronologically in Figure 6.1-1. These data record declines in arithmetic mean blood lead levels of nearly 70 µg/dL in certain populated areas of the BHSS to less than 10 µg/dL over approximately 25 years of blood lead health intervention and remedial activities (Van Lindern 2000a). As shown, since the inception of remedial activities in 1989, blood lead levels have decreased by 70 percent in Smelterville (from 14.2 to 4.3 µg/dL), 58 percent in Kellogg (from 10.8 to 4.5 µg/dL), 55 percent in Wardner (from 11.8 to 5.4 µg/dL), 67 percent in Page (12.5 to 4.1 µg/dL), and 33 percent in Pinehurst (7.4 to 5.0 µg/dL).

Figure 6.1-2 shows the decline in the percentage of children in the BHSS whose blood levels were above 10 µg/dL. This figure shows the clear relationship between yard remediation, which began in 1989, and decreasing blood lead in children. It also shows that the soil and source material RAO (95 percent of children with blood lead below 10 µg/dL) was achieved in the BHSS by 1999.

The declining blood lead levels that have occurred in the BHSS provide validation to and confidence in the human health remedies implemented, namely, health education and intervention programs, vacuum loan programs, and residential and common use soil removal and replacement actions. The successful declining blood lead results achieved at the BHSS provide valuable lessons for future human health actions outside the area.

The results of additional state and local public health surveys conducted in the basin (outside the BHSS) since 1996 indicate consistent excessive levels of lead absorption in children with little problem identified among adults (although specific data are not available for pregnant women). Table 6.1-1, taken from the human health risk assessment (TerraGraphics and URSG 2000), summarizes the blood lead levels measured in these surveys for 0- to 6-year-old children.

Site-specific analysis of blood lead data paired with environmental lead data suggests complex exposure pathways. Blood lead levels appear to be most closely related to lead in house dust, followed by independent effects of lead in yard soil, the condition of interior lead-based paint, and the lead content of exterior paint (TerraGraphics and URSG 2000). High blood lead levels in the lower basin have been associated with homes that were flooded in 1996, and recreational activities outside the home (TerraGraphics and URSG 2000).

6.1.4 Human Health Risk Assessment

In the human health risk assessment, major population groups were quantitatively evaluated for a variety of exposure pathways, media, contaminants, and geographical areas. The receptors and pathways that were evaluated fall into the following five exposure scenarios:

- Residential—evaluated for children and adults who live in the basin. This evaluation was conducted for a variety of pathways with potential exposure to affected media in the home, in the yard and community, and from homegrown vegetables. In addition, a potential future drinking water evaluation for shallow groundwater in the Burke/Ninemile area was performed.

- Neighborhood recreational—evaluated, in addition to the residential scenario, for community soils incremental exposures for children at play in neighborhood creeks and waste piles.

- Public recreational—evaluated for children and adults who use developed parks and playgrounds, and undeveloped recreational areas whether they are residents or visitors. Exposure scenarios included the incidental ingestion of soils and surface water and the ingestion of fish by sport fishermen.

- Occupational—evaluated for adult construction workers.

- Subsistence—evaluated for children and adults who have potential future traditional or modern subsistence lifestyles.

The risks of the presence of lead and non-lead metals were evaluated separately for each of the scenarios as summarized in the following sections.

6.1.5 Lead Risk Summary

Lead health risk methods are unique owing to the ubiquitous nature of lead exposures and the reliance on blood lead concentrations to describe lead exposure, toxicity, and risks. Lead risks are characterized by predicting blood lead levels with computer models and guidance developed by EPA, available from the following web site:

http:\\www.epa.gov\superfund\programs\lead\prods.htm – software.

In contrast to risk assessment methodologies for cancer or non-cancer risks, lead risk assessments use central tendency exposure values to predict a central tendency (geometric mean) blood lead level. The predicted geometric mean blood lead level is then used in conjunction with a modeled log-normal distribution to estimate the probability of exceeding a target blood lead level of 10 micrograms per deciliter (µg/dL). Blood leads levels are a measure of internal dose

that has been related to many adverse health effects (National Research Council Committee on Measuring Lead in Critical Populations 1993). This emphasis on blood lead integrates exposure, toxicity, and risk, which are separated in other types of risk assessment. For other chemicals, risk is described in terms of an external dose (e.g., mg/kg/day).

The EPA Integrated Exposure Uptake Biokinetic Model (IEUBK) was used to predict blood lead levels in children up to 84 months of age (USEPA 1994b). The EPA Adult Lead Model (ALM) was used to predict blood lead levels in fetuses (USEPA 1996).

As discussed previously, lead health surveys conducted in the basin area by State and local health authorities have noted excessive levels of blood lead in children, with only minor problems among adults. The human health risk assessment explained the contributions that the various exposure pathways and media made to the lead risk by showing the percentages that each pathway or medium would contribute to the average child's exposure. For illustrative purposes, Figure 6.1-3 shows the percentage of lead that an average child would receive from each of the lead sources if all the information in the entire basin were combined. However, this "average child" does not actually exist, and exposures for individual children would be determined by the characteristics of their yard and that child's activities. For example, a child's exposure would vary depending on whether he or she ate homegrown vegetables, or the amount of time he or she spent in the home or playing outside. If a child were to play on waste piles, his exposure to lead would depend on how long he or she played on the pile, and the pile's concentration of lead. To account for the variations among children, the human health risk assessment attempted to estimate the reasonable maximum time a child would engage in each activity. As shown in Figure 6.1-3, the home is the largest contributor to lead exposures for the average child, (at least 50 percent) even if a child receives lead from all other sources in the basin. Thus, the human health risk assessment focused primarily on lead contamination in the media of concern, especially around the home.

Considering the home exposure to be the primary single contributor to the residential lead risk within the basin, Figure 6.1-4 shows a further breakdown of lead exposure within the home, again based on basin-wide averages. This figure indicates that house dust is the major source of home lead exposure, contributing 56 percent, followed by outdoor residential soil, which accounts for 31 percent of lead exposure in the home. (House dust lead concentrations are total lead in dust and thus include all sources of lead, such as interior paint, as well as lead dust from yard and community soils.) Air, drinking water, and typical diet contribute comparatively little to lead exposure in the home.

6.1.6 Non-Lead Metals Risk Summary

For non-lead metals, the human health risk assessment considered two levels of contaminant intake, referred to as the central tendency (CT) and the reasonable maximum exposure (RME). The CT estimate is the most typical level of exposure, while the RME represents the maximum intake that can reasonably be expected.

Health risks for chemicals that cause cancer are calculated differently than those chemicals that cause non-cancer health effects. For non-cancer risks, if a person is exposed to a chemical dose equal to or less than the "threshold," no adverse effects are expected. The "hazard quotient" for a chemical is the chemical dose from the site divided by the threshold dose. If the hazard quotient is less than 1, then no adverse effects are anticipated. Cancer risks are calculated assuming that the presence of carcinogens, at any dose, contribute to risk. Risk indices are presented as a probability of developing cancer. A cancer risk level of 1×10^{-6} is equivalent to one person in a million developing cancer. The EPA uses the general risk range of 1×10^{-4} to 1×10^{-6} as a "target range" within which they try to manage risks as part of a Superfund cleanup.

The results of the risk characterization for non-lead metals reported in the human health risk assessment indicate that some exposure areas could pose an unacceptable threat of non-cancer effects for some individuals and exposure media under the RME condition. These include:

- Young children exposed to arsenic in yard soil in the lower basin, the Side Gulches, Osburn, Mullan, and Burke/Ninemile
- Young children exposed to iron in yard soil in the lower basin
- Children/adults exposed to arsenic in yard soil and tap water in the Side Gulches
- Young children and children/adults who could ingest cadmium and zinc in groundwater in Burke/Ninemile in the future (groundwater at Burke/Ninemile is not currently used as a drinking water source)
- Young children and children/adults ingesting cadmium in homegrown vegetables
- All residents and pathways for subsistence lifestyles

A summary of the non-lead metal pathway/exposure scenarios which exceed the target risk goals is presented in Table 6.1-2.

Arsenic is the only carcinogen evaluated at the site. Cancer risk estimates exceeded 1×10^{-6} for all individuals in all exposure areas under the RME condition, and Table 6.1-2 summarizes use scenarios and pathways where the estimated risk exceeds 10^{-4}. For residential scenarios, yard surface soil contributed the most to cancer risk. For residents in the Side Gulches, tap water also contributed significantly to cancer risk. Although tap water was not the primary contributor to cancer risk for residential scenarios, RME cancer risk estimates for tap water exceeded 1×10^{-6} in all exposure areas. This risk is almost entirely due to selected high concentrations of arsenic in scattered private wells. For the Burke/Ninemile future residential scenario, groundwater contributed nearly all of the cancer risk. Depending on the exposure area, one or more of various

media (upland surface soil, soil/sediment, sediment, or waste piles) contributed the most to cancer risk for recreational visitors. Although surface water was never the primary contributor to cancer risk, RME cancer risk estimates for "disturbed" surface water exceeded 1×10^{-6} for recreational scenarios in several exposure areas. Surface/subsurface soil contributed all of the cancer risk for construction workers.

None of the metals evaluated in fish tissues represent a health risk for sport anglers. However, for a traditional subsistence ingestion scenario, for an assumed daily intake of 540 grams per day, health risk goals were exceeded for both perch and northern pike.

Surface soil and sediment contributed the most to hazards and cancer risks for the subsistence scenarios. The current subsistence scenario had similar hazards to those found for the highest residential child exposures. Cancer risks were higher for the current subsistence scenario, but close to those for the highest residential exposures. Hazards and risks for the traditional subsistence scenario were an order of magnitude higher than those for the residential scenario. For the current subsistence scenario, arsenic and iron were the only chemicals with hazard quotients greater than 1, similar to residential hazards. For the traditional scenario, mercury in fish, manganese in soil and sediment, and cadmium in water potatoes also had hazard quotients greater than 1 in addition to arsenic and iron. Hazards from mercury in fish are likely underestimated for subsistence tribal members because they eat the whole fish, not just fillets.

Combinations of the exposure scenarios described above (e.g., child/adult residential plus neighborhood recreational) would result in hazard/risk estimates that are higher than those discussed in this summary. However, combining the risk and hazard numerical results from the scenarios probably overestimates the total numerical hazard/risk for actual residents. For example, child/adult residents are assumed to spend 24 hours per day, 350 days per year at the residence. Assuming that they also regularly spend several hours per day at a neighborhood or public recreational area or are occupationally exposed results in "double counting" (exposure for more than 24 hours per day), which will overestimate hazard/risk. However, it is clear that many of these additional exposure pathways could result in higher total risks than those shown for residential individuals.

6.2 ECOLOGICAL RISKS

To facilitate evaluation of risks, the Basin was divided into five conceptual site model (CSM) units that are differentiated based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes. The CSM units were further subdivided into watersheds and segments The five CSM units are:

- CSM Units 1 and 2, Upper Basin (Figures 1.0-2 and 1.0-3)
- CSM Unit 3, Lower Basin (Figure 1.0-4)

- CSM Unit 4, Coeur d'Alene Lake (Figure 1.0-5)
- CSM Unit 5, Spokane River (Figure 1.0-6)

Three priority issues have been identified as an initial primary focus with respect to ecological protection.

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams.** These metals have harmful effects on aquatic receptors, including fish. [should include back in Section 6 also. Approximately 20 miles of the South Fork and 10 miles of tributaries are unable to sustain reproducing fish populations. Species density and diversity are reduced throughout the Basin, and 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 ESA. The ambient water quality criteria for zinc and cadmium are exceeded throughout the Coeur d'Alene River system downstream of mining impacts, in Coeur d'Alene Lake, and in the Spokane River.

- **Lead in wetlands and floodplains.** Existing lead contamination has harmful effects on waterfowl and plants. Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. The total number of waterfowl dying of lead poisoning has not been estimated, however, 682 dead or sick birds were found in the Basin between 1992 and 1997. The number of waterfowl carcasses found in 1997 represented the largest documented die-off in the Coeur d'Alene River Basin since 1953. 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 at reference sites nationally.

- **Particulate lead in the surface water.** Lead transported downstream in the river system is a continuing source of contamination to 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 warning 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 habitat areas cleaned up as part of the remedy.

An ecological risk assessment was conducted for the Basin that focused on the effects of metals in contaminated media at known source areas on ecological receptors. The ecological receptors evaluated included mammals, birds, fish and other aquatic organisms, amphibians, terrestrial plants, and soil invertebrates and processes. In addition to the direct effects of metals, the

ecological risk assessment also evaluated the effects of physical and biological ecosystem characteristics.

The ecological risk assessment concluded that metals, principally cadmium, lead, and zinc, present significant risks to most ecological receptors throughout the Basin. Few species had no identifiable risks. Some risks were identified for all receptor classes.

Some species present in the Basin are considered to be "special-status species," including those listed as endangered or threatened under the Endangered Species Act (ESA), those listed by the U.S. Fish and Wildlife Service (USFWS) as species of concern, state-listed sensitive plant species, and culturally significant plant species. Examples include the bull trout, westslope cutthroat trout, bald eagle, black tern, gray wolf, lynx, spotted frog, Ute ladies'-tresses, and water potato.

6.2.1 Impacts on Aquatic Receptors

Ranges of metals concentrations in water that have resulted in acute and chronic effects on various salmonids are shown on Figures 6.2-1 and 6.2-2 for cadmium and zinc, respectively. The estimated average concentrations of these metals at selected key locations in the Basin also are shown. The bull trout is listed as threatened under the ESA.

In addition to the direct toxic effects of metals, risks to aquatic receptors also are associated with physical and biological ecosystem characteristics. Increased bank instability, change in stream channel substrate composition and mobility, increased water temperature (from the loss of riparian vegetation along streams), and habitat fragmentation pose a risk to aquatic organisms.

Fish populations and species diversity are degraded in the following segments:

- Upper South Fork Segment 1 (below Mullan)
- Canyon Creek Segments 3, 4, and 5
- Ninemile Creek Segments 2 and 4
- Pine Creek Segments 1 and 3
- South Fork (MidGradient) Segments 1 and 2
- Coeur d'Alene River Segments 1, 2, 3, 4, and 5

6.2.2 Impacts on Waterfowl

Twenty species of migratory waterfowl have been documented to use the Lower Basin. An estimated 13,000 acres of a total of 18,000 acres of wetland habitat contain lead at concentrations that are chronically or acutely toxic to waterfowl (greater than 500 mg/kg and 1,800 mg/kg,

respectively).[3] Migratory birds are protected under the Migratory Bird Treaty Act. Studies of the effects of metals in sediment in the Basin have resulted in the following conclusions. For waterfowl, exposure results primarily from ingestion of sediment.

- All species of migratory bird examined from the mid 1980s to present have documented lead exposure. This represents over 20 species of birds inhabiting the Coeur d'Alene River Basin flood plain. This list includes species at all levels of the food web including waterfowl, birds of prey, and songbirds. The results of these investigations have been published in 14 peer-reviewed manuscripts.

- Lead poisoning not associated with hunting or fishing was the greatest single cause of sickness or death (71.4 percent) in animals found in the Coeur d'Alene River Basin.

- Lead poisoning has been documented in Coeur d'Alene River basin waterfowl during all four seasons and from flood plain habitat stretching from Smelterville to Harrison.

- Eleven species (10 species of migratory birds, 1 species of mammal) have been documented with lead poisoning: Canada goose, tundra swan, trumpeter swan, mallard, American wigeon, northern pintail, canvasback, redhead duck, common goldeneye, wood duck, and meadow vole.

- Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. From 1992-97, lead poisoning associated with the ingestion of contaminated sediments was the primary cause of death in all waterfowl found dead in the Coeur d'Alene Basin. These waterfowl mortality events continue every year since the 1992-97 investigation and have been observed by USFWS including observations as recently as March and April 2001.

- Baseline or reference sites locally, regionally, and nationally have lead poisoning in tundra swans (primarily due to lead shot or sinkers) representing 20-30 percent of the total mortality. In the Coeur d'Alene River Basin, lead poisoning (primarily due to ingestion of contaminated sediments) is responsible for 96 percent of the total mortality.

- There were 13.4 times more tundra swans found sick or dead in the Coeur d'Alene River Basin than an adjacent reference area. There were 34.3 times more

[3] Estimates of remediation areas and associated costs are based on lead concentration of 1,000 mg/kg. The difference in remediation areas based on 500 and 1,000 mg/kg lead is small, and is less than the contingency included in the cost estimate.

Canada geese found sick or dead in the Coeur d'Alene River Basin during spring migration than an adjacent reference area.

- 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 River Basin have not decreased. Therefore, animals dying of lead poisoning due to the ingestion of contaminated soils and sediments is expected to continue.

- The total number of waterfowl dying of lead poisoning has not been estimated. The USFWS has only found a fraction of the total number dead in the >18,000 acres of flood plain habitat that exist in the Coeur d'Alene River basin.

- Between 1992 and 1997, 682 dead or sick birds were found in the Basin

6.3 COEUR D'ALENE LAKE

The beaches and wading areas adjacent to Coeur d'Alene Lake and the Idaho portion of the Spokane River were sampled in 1998 and were found to not exceed risk-based levels for recreational use. People using the 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 for protection of human health.

The water in Coeur d'Alene Lake is also classified as a source of drinking water by the state of Idaho and meets the safe drinking water standard for metals with the only exception found when the Coeur d'Alene River flows are high (e.g., during high spring run-off or during flood events) causing short-term lead concentrations that exceed drinking water standards.

Some questions have been raised by the Coeur d'Alene Tribe and others regarding the need to determine potential risks to humans who eat whole fish and filets taken from fish in the lake. Because metals concentrations are higher in whole fish than in filets, consumption of whole fish would increase risk. Previous fish tissue sampling efforts did not include whole fish from Coeur d'Alene Lake. EPA anticipates conducting additional fish tissue sampling to evaluate the potential risks resulting from eating fish from the lake.

The water in the Lake exceeds the water quality standards for cadmium and zinc and intermittently for lead, posing a potential risk to fish or other aquatic life. The sediments at the bottom of the Lake contain mining contamination. While some dissolution of metals from the sediments into the water column is occurring, existing data show the lake acts as a net sink for cadmium, lead, and zinc (Table 4.2-5). However, it is possible that increased rates of metals

dissolution could occur if anoxic conditions develop in the hypolimnion. Increased metal dissolution from lakebed sediments could impact water quality in the lake and the Spokane River. Anoxic conditions could possibly develop if a substantial increase in biological productivity occurs. In the lake, biological productivity is generally limited by the availability of nutrients, especially phosphorus, although the productivity of phytoplankton may be limited by zinc toxicity.

Several measures have been implemented that have resulted in improvements in lake water quality and decreases in the loads of nutrients discharged into the lake, including:

- In the late 1960s, the direct discharge of tailings into the river was discontinued and settling basins and tailings impoundments were installed.
- In the mid-1970s, improved sewage treatment technologies were installed.
- Forestry best management practices (e.g., control of sediment runoff) have been implemented.
- The fertilizer plant at Bunker Hill ceased discharging.
- Agricultural water quality improvements have been implemented.
- Boat pump-out stations and restrooms at recreation areas have been installed.
- Lake protection educational materials have been distributed to lake shore owners and recreational users.
- Kootenai County has implemented a site disturbance ordinance to control erosion from development sites.

Table 6.3-1 shows historic loads of nutrients (phosphorus and nitrogen) discharged into the lake. From 1975 to 1999, estimated total phosphorus loads into the lake from the Coeur d'Alene River decreased from 98,000 kilograms per year to 49,000 kilograms per year (50 percent decrease) and total nitrogen loads decreased from 1,490,000 kilograms per year to 390,000 kilograms per year (74 percent decrease).

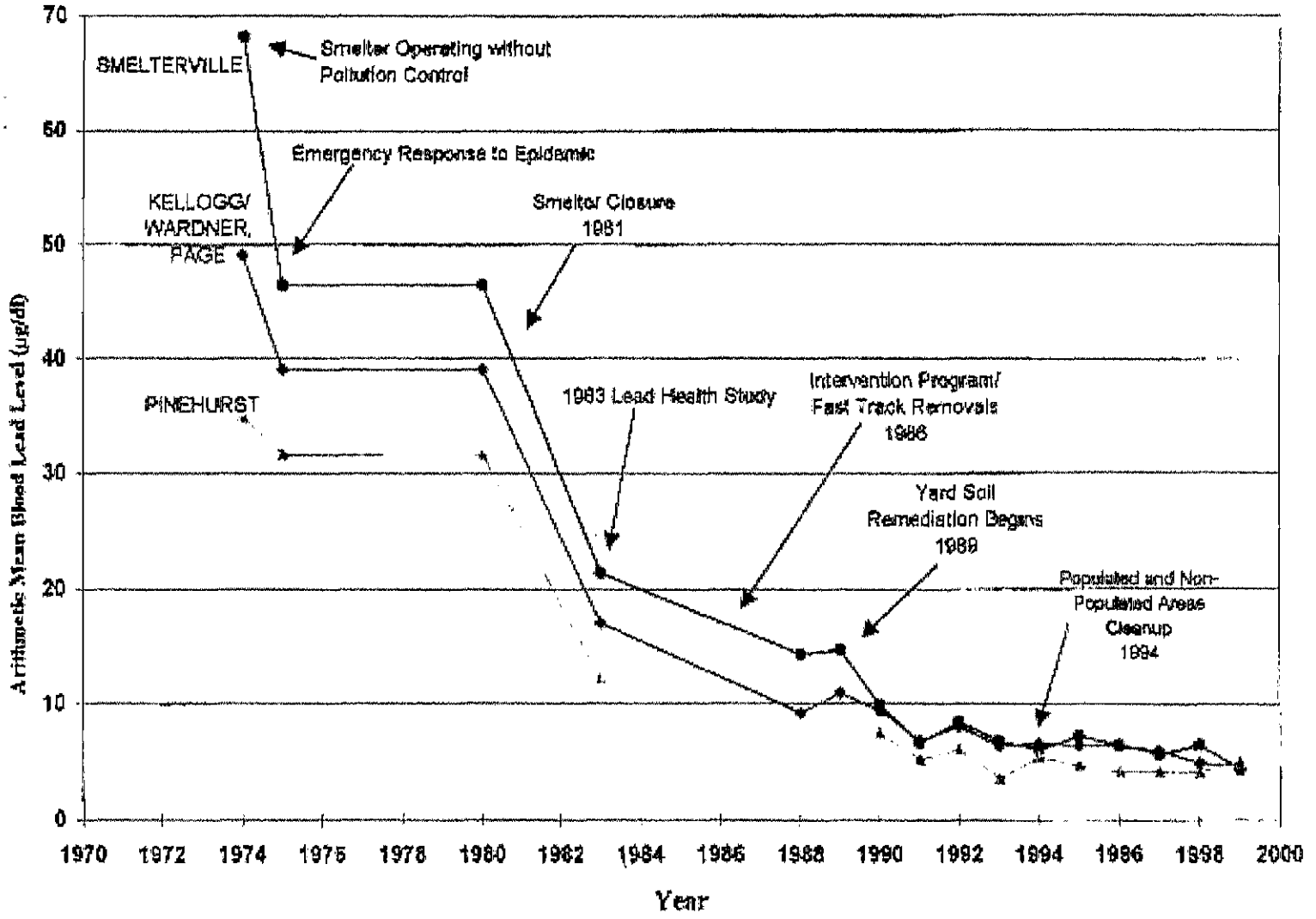
6.4 SPOKANE RIVER

In response to metals contamination, the Washington State Department of Health and Spokane Regional Health District have issued two health advisories for the upper reaches of the Spokane River. The first advisory responds to the presence of elevated lead in shoreline and beach sediments frequented by recreationalists. The second responds to elevated lead concentrations in

fish. Recommended fish consumption limits for children and adults have been established, with particular emphasis toward children and pregnant women or women considering pregnancy.

The AWQC for dissolved zinc, cadmium, and total lead are exceeded in the Spokane River, due to metals that come from the Coeur d'Alene River via Coeur d'Alene Lake. Total lead and cadmium usually only exceed AWQC during and after high discharge periods in the Coeur d'Alene River, when the river carries a large sediment load.

The Spokane Tribe has expressed concerns that the previous studies do not fully account for the metals exposures that may be experienced by tribal members that practice a subsistence lifestyle. The Tribe is planning additional testing and studies to evaluate these exposures.



NOTE:
Taken from Figure 4-1, Final 1999 Five Year Review Report, Bunker Hill Superfund Site, prepared by TerraGraphics Environmental Engineering, April 2000.

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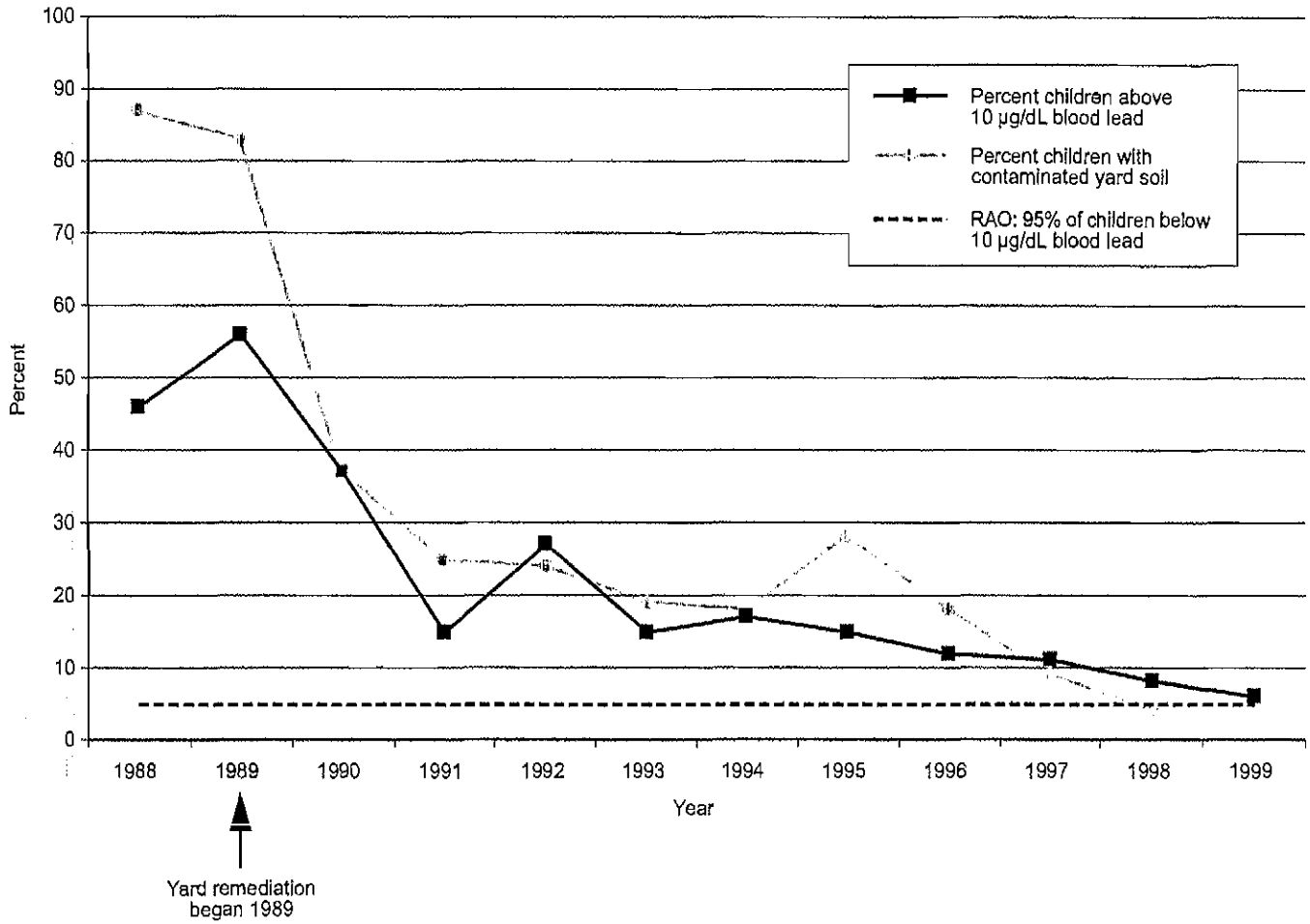
RRB11

Figure 6.1-1
Children's Blood Lead Levels by Year, 1974 - 1999



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

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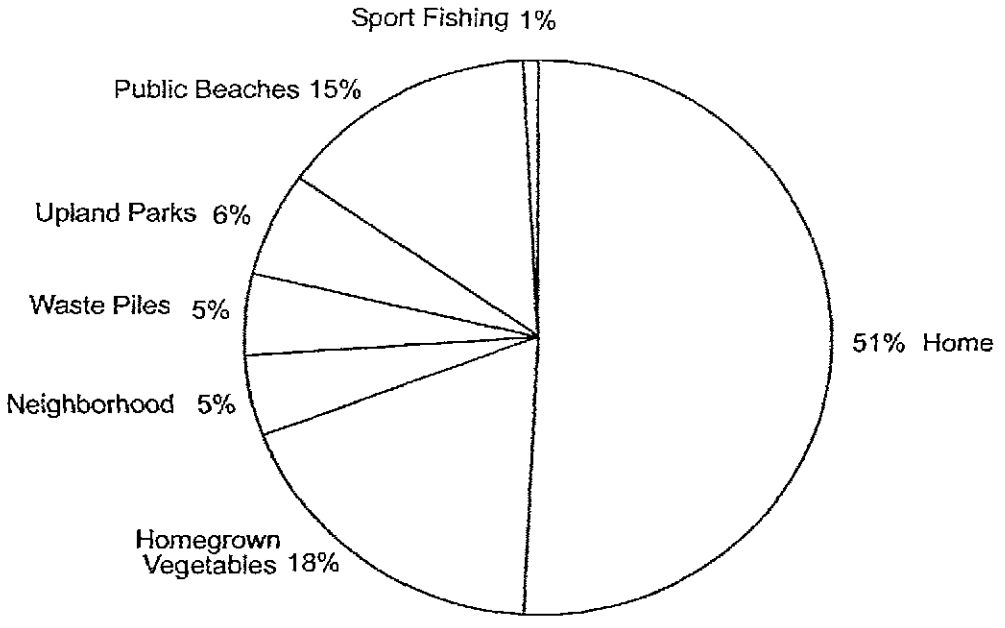
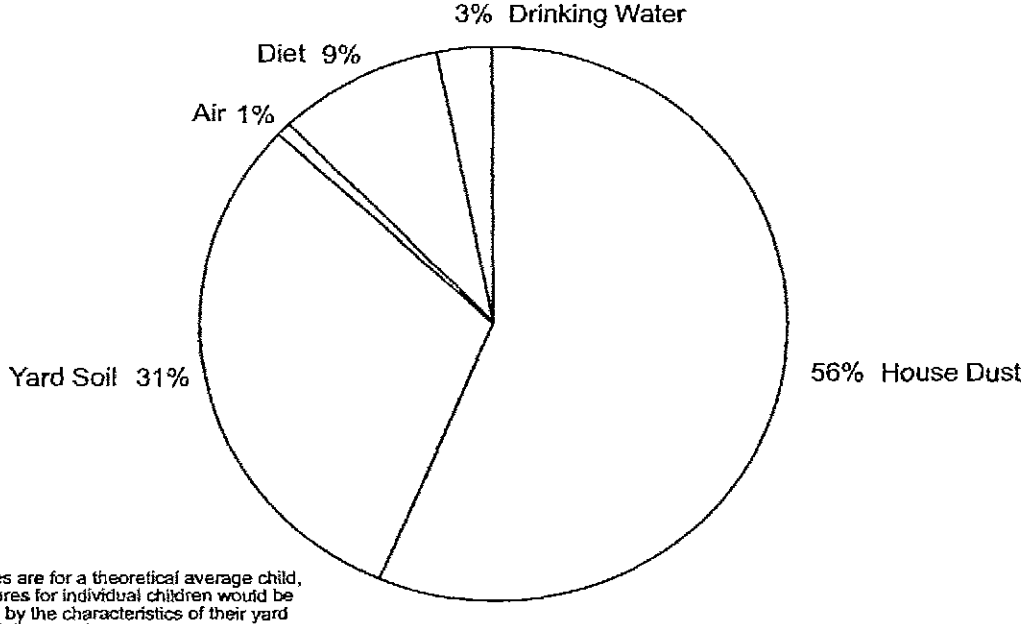
RRB12

Figure 6.1-2
Trends in Children's Blood Lead and Children with Contaminated Yards, Bunker Hill, 1988-1999



NOTE: Percentages are for a theoretical average child, and exposures for individual children would be determined by the characteristics of their yard and that child's activities. Data were compiled from the Human Health Risk Assessment, TerraGraphics, 2000.

Figure 6.1-3
Average Child's Basin-Wide Lead Exposure



NOTE: Percentages are for a theoretical average child, and exposures for individual children would be determined by the characteristics of their yard and that child's activities. Data were compiled from the Human Health Risk Assessment, TerraGraphics, 2000.

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FS PART 1

RRB13

Figure 6.1-4
Average Child's Home Lead Exposure

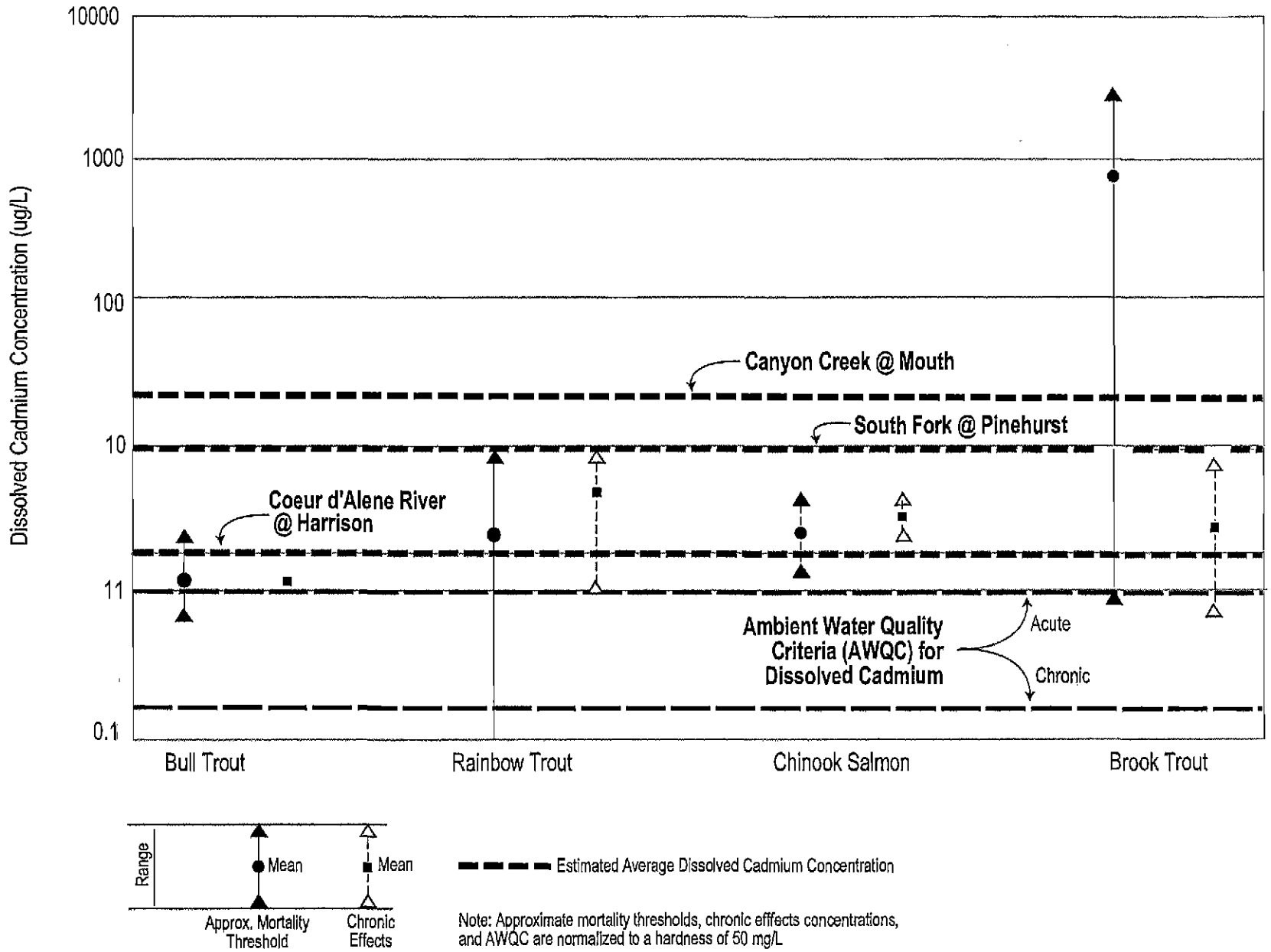

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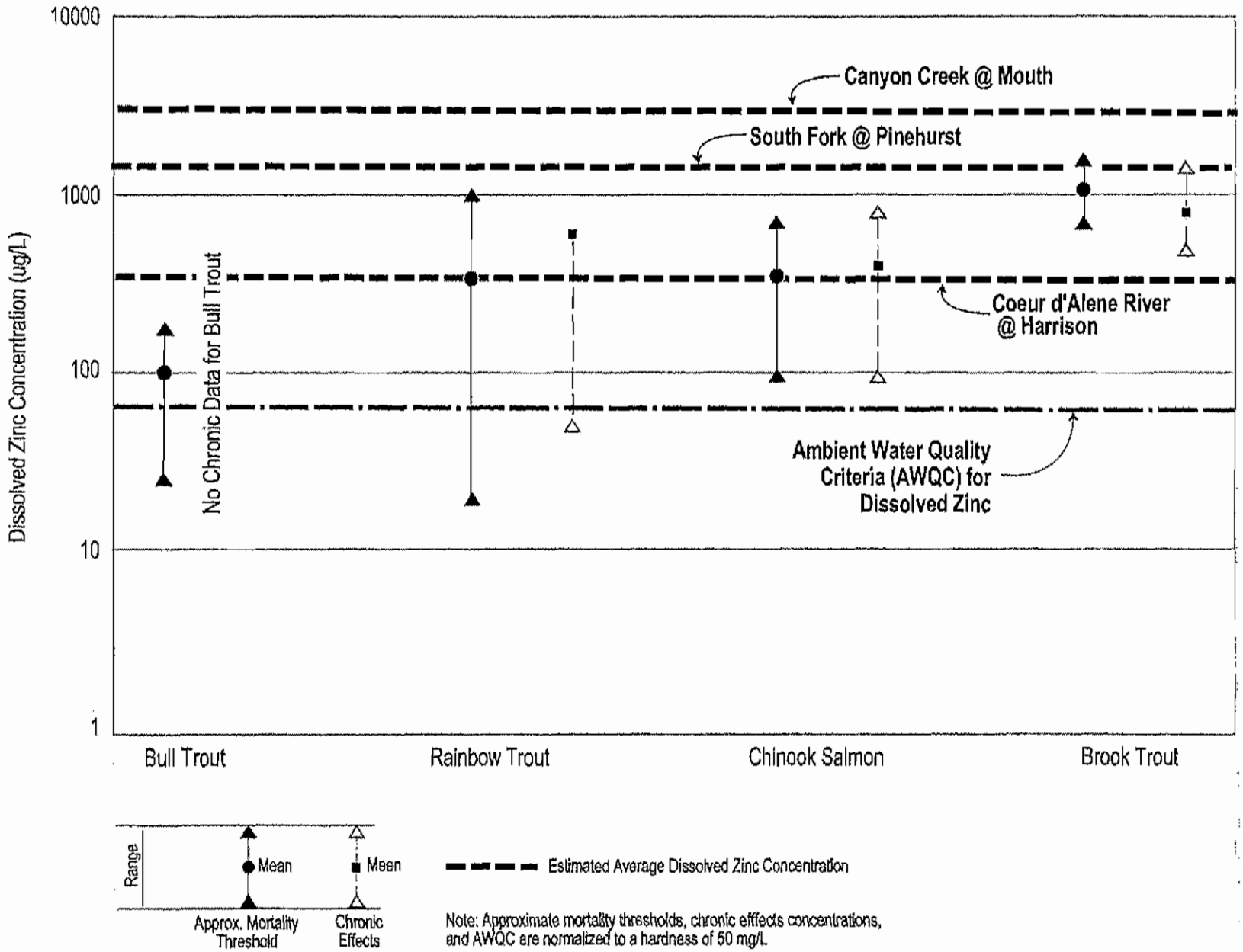
Figure 6.2-1
Preliminary Draft Cadmium Acute and Chronic Effects Concentrations for Selected Salmonids



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RRB14

Figure 6.2-2
Preliminary Draft Zinc Acute and Chronic Effects Concentrations for Selected Salmonids

Table 6.1-1
Basin Blood Lead Levels for 1-6 Year Old Children, All Years Combined

Age (years)	N	Percent Participation	Cumulative Percent	Measured Blood Lead Level, µg/dL					# ≥ 10 µg/dL	% ≥ 10	Age-Adjusted % ≥ 10	# ≥ 15 µg/dL	% ≥ 15 µg/dL	Age-Adjusted % ≥ 15
				Minimum	Maximum	Arithmetic Mean	Standard Deviation	Geometric Mean						
1	40	13.2%	13.2%	2	16	7.0	3.6	6.2	8	20.0%	25.3%	2	5.0%	6.3%
2	46	15.2%	28.4%	2	29	8.0	6.3	6.3	12	26.1%	28.6%	8	17.4%	19.1%
3	52	17.2%	45.5%	1	21	6.5	4.5	5.2	10	19.2%	18.7%	4	7.7%	7.5%
4	57	18.8%	64.4%	1	21	5.5	4.2	4.4	7	12.3%	10.9%	3	5.3%	4.7%
5	62	20.5%	84.8%	1	16	5.4	3.0	4.7	5	8.1%	6.6%	2	3.2%	2.6%
6	46	15.2%	100.0%	1	20	4.8	3.3	4.0	3	6.5%	7.2%	1	2.2%	2.4%
All	303	100%		1	29	5.3	4.0	4.2	45	14.9%	16.2%	20	6.6%	7.1%

Table 6.1-2
Reasonable Maximum Exposure Risk from Non-Lead Contaminants[a]

RME HAZARD INDEX EXCEEDS 1[b]

Receptor/Pathway/Contaminant/Medium	RME HI[c]
Residential Scenario	
Young children exposed to arsenic in yard soil	
Lower Basin	2
Side Gulches	2.2
Osburn	2
Mullan	2
Burke/Ninemile	2
Young children exposed to iron in yard soil, Lower Basin	2
Children/Adults exposed to arsenic in yard soil and tap water, Side Gulches	1.6
Young children ingesting cadmium in potential future groundwater used as drinking water, Burke/Ninemile	17
Young children ingesting zinc in potential future groundwater used as drinking water, Burke/Ninemile	4
Children/Adults ingesting cadmium in potential future groundwater used as drinking water, Burke/Ninemile	9
Children/Adults ingesting zinc in potential future groundwater used as drinking water, Burke/Ninemile	2
Young children ingesting cadmium in homegrown vegetables, all areas	2
Children/Adults ingesting cadmium in homegrown vegetables, all areas	2
Children, all pathways, potential future modern subsistence lifestyles, any area	10
Subsistence Scenario	
Children/Adults, all pathways, potential future modern subsistence lifestyles, any area	4
Adults, all pathways, potential future modern subsistence lifestyles, any area	3
Children, all pathways, potential future traditional subsistence lifestyles, any area	49
Children/Adults, all pathways, potential future traditional subsistence lifestyles, any area	21
Adults, all pathways, potential future traditional subsistence lifestyles, any area[d,e]	10

RME CANCER RISK EXCEEDS 1 X 10^{-4} (Arsenic is the only carcinogenic COPC)[f]

Receptor/Pathway/Medium	RME CR[g]
Residential Scenario[h]	
Child/Adult, yard soil and tap water	3×10^{-4}
Child/Adult, yard soil only	1.2×10^{-4}
Child/Adult, tap water soil only	1.9×10^{-4}
Modern Subsistence Scenario (potential future)[d]	
Total (any area, child/adult)	8×10^{-4}
Child/Adult, incidental ingestion of surface soil	2×10^{-4}
Child/Adult, dermal exposure to sediment	2×10^{-4}
Child/Adult, incidental ingestion of sediment	2×10^{-4}
Child/Adult, ingestion of surface water	2×10^{-4}
Traditional Subsistence Scenario (potential future)[e]	
Total (any area, child/adult)	4×10^{-3}
Child/Adult, dermal exposure to surface soil	2×10^{-4}
Child/Adult, incidental ingestion of surface soil	1×10^{-3}
Child/Adult, dermal exposure to sediment	7×10^{-4}
Child/Adult, incidental ingestion of sediment	6×10^{-4}
Child/Adult, ingestion of surface water	1×10^{-3}

Table 6.1-2 (Continued)
Reasonable Maximum Exposure Risk from Non-Lead Contaminants[a]

Notes:
[a] From pages 5-10 and 5-11 human health risk assessment (Terragraphics and URSG 2000)
[b] From Table 5-1, human health risk assessment (Terragraphics and URSG 2000)
[c] HI = hazard index (greater than 1, adverse health effects expected)
[d] From Table 5-4, human health risk assessment (Terragraphics and URSG 2000)
[e] From Table 5-5, human health risk assessment (Terragraphics and URSG 2000)
[f] From Table 5-5, human health risk assessment (Terragraphics and URSG 2000)
[g] CR = cancer risk

Table 6.3-1
Historic Loads of Total Phosphorus and Total Nitrogen to Coeur d'Alene Lake

Load Source	1975 loads[1]		1991 loads[2]		1999 loads[3]	
	TP	TN	TP	TN	TP	TN
Coeur d'Alene River	98,100	1,490,000	22,000	800,000	49,000	349,000
St. Joe River	56,300	1,480,000	72,100	1,040,000	20,600	253,000
Other	25,600	430,000	38,900	429,000	NR	NR
Total to Lake	180,000	3,400,000	133,000	2,270,000	NR	NR

All values expressed in kilograms
[1] From USEPA (1977); loadings based on long-term annual mean discharge
[2] From Woods and Beckwith (1997); annual discharge was about 130% of average
[3] From Woods (2000); annual discharge was about 120% of average

Notes:
NR - not reported
TN - total nitrogen
TP - total phosphorus

7.0 REMEDIAL ACTION OBJECTIVES, PRELIMINARY REMEDIAL GOALS, AND APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section identifies the objectives of the comprehensive remedial actions in the Coeur d'Alene Basin. RAOs provide a general description of what a CERCLA cleanup would be designed to accomplish (USEPA 1988).

7.1 BASIN-WIDE HUMAN HEALTH RAOS

RAOs developed for protection of human health in the Coeur d'Alene Basin are identified in Table 7.1-1. The RAOs for groundwater protection are not fully developed due to a lack of data concerning the extent of groundwater contamination.

7.2 BASIN-WIDE ECOLOGICAL RAOS

The RAOs for protection of ecological receptors are identified in Table 7.2-1. Many of the RAOs are based on achieving a remediation goal, or cleanup level, which is a concentration of a chemical in a specific medium. Table 7.2-2 shows the preliminary remediation goals (PRGs) for chemicals of concern in soil, sediment, surface water, and groundwater for protection of ecological receptors. PRGs for surface water are equal to the AWQC (for fish and other aquatic organisms) or the concentration determined by the risk assessment to be potentially harmful to aquatic plants, whichever is less. The AWQC depend on the hardness of the water, and increase as the hardness increases. Because there are no Federal or State cleanup levels for soil or sediment contamination, PRGs for these media are based on the most sensitive receptor, as determine by the baseline risk assessment, or the estimated background concentration, whichever is greater. The PRGs for cadmium, lead, and zinc in soil and sediment are all set at the 90th percentile upper confidence limit background concentration (that is, there is a 90 percent likelihood that the true, or actual, background concentration is less than the PRG). The PRGs could be changed as additional information becomes available.

It is unlikely that certain of the RAOs, e.g., meeting TMDLs and AWQCs, would be achieved without an extended period of natural recovery, even if the majority of contamination were removed or contained. However, without active remediation it is estimated that more than 1,000 years would be required to meet RAOs through natural processes alone (URSG 2001).

As discussed earlier, and as part of the preferred Basin-wide comprehensive alternative implementation, EPA plans to develop a set of interim benchmarks. These interim benchmarks would be near-term goals that would serve as landmarks to measure the progress of the remedy toward achievement of the Basin-wide RAOs. As an example, soil and sediment concentration

interim benchmarks may vary depending on specific land use and receptors of concern (e.g., an interim lead benchmark of 500 mg/kg to protect waterfowl in specified wetland areas). These interim benchmarks will be established in the ROD after public input during the comment period. The current preference is to complete cleanup at a watershed or watershed segment level in CSM Units 1 and 2 and to reduce the area of contaminated habitat in CSM 3. Table 7.2-3 provides examples of how interim benchmark RAOs would be identified in the ROD.

7.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Potential chemical-specific ARARs for the Basin-wide remediation are presented in Tables 7.3-1 through 7.3-7. Potential location-specific ARARs are presented in Table 7.3-8. Potential action-specific ARARs are presented in Tables 7.3-9.

Table 7.1-1
Remedial Action Objectives for Protection of Human Health in 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. Prevent the exposure of humans to lead in soil and sediments such that there is a 95% or greater probability that a child or children ages 0 to 84 months have blood lead levels less than 10 µg/dL, and a 1% or lower probability that a child or children ages 0 to 84 months have blood lead levels greater than 15 µg/dL.[a] Prevent direct human exposure to soils and sediments (ingestion, inhalation, and dermal contact) that: • Would produce excess cancer risks greater than 1×10^{-6} OR • Have concentrations of COPCs greater than selected PRGs for soil.
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 COPCs for drinking water exceeding selected PRGs for drinking water.
House Dust	Prevent the introduction of lead to residences from areas outside the home via tracking and air pathways so that there is a 95% or greater probability that a child or children ages 0 to 84 months have blood lead levels less than 10 µg/dL, and a 1% or lower probability that a child or children ages 0 to 84 months have blood lead levels greater than 15 µg/dL.[a]
Fish Consumption	Prevent ingestion by humans of aquatic organisms from surface waters containing contaminants of concern exceeding risk-based threshold concentrations
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 COPCs greater than rural northern Idaho background levels.

[a]Development of these objectives are based on directives by EPA OSWER as presented in Appendix D of the FS Part 2 (TerraGraphics and URSG 2000).

Notes:
NAAQS – National Ambient Air Quality Standards
OSWER – Office of Solid Waste and Emergency Response
TSP – total suspended particulates
µg/dL – micrograms per deciliter

Table 7.2-1
Remedial Action Objectives for Protection of Ecological Receptors in the Coeur d'Alene Basin

Subject	Remedial Action Objective
Ecosystem and physical structure and function	Remediate soil, sediment, water quality, and habitat so that it is capable of supporting a functional ecosystem for the aquatic and terrestrial plant and animal populations in the Coeur d'Alene Basin Maintain (or provide) soil, sediment, water quality, and habitat supportive of individuals of special-status biota that are protected under the Endangered Species Act and the Migratory Bird Treaty Act
Soil, sediment and source materials	Prevent ingestion of arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that exceed ecological PRGs Reduce loadings of metals from soils and sediments to surface water so that loadings do not cause exceedances of surface water PRGs Prevent transport of metals from soils and sediments to groundwater at concentrations that exceed surface water PRGs Prevent dermal contact with arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that exceed ecological PRGs
Mine water seeps, springs, and leachate	Prevent discharge of seeps, springs, and leachate to surface water at concentrations that exceed surface water PRGs
Surface water	Prevent ingestion of cadmium, copper, lead, and zinc by ecological receptors at concentrations that exceed surface water PRGs Prevent dermal contact with cadmium, copper, lead, and zinc by ecological receptors at concentrations that exceed ambient water quality criteria or state or tribal water quality standards
Groundwater	Prevent discharge of groundwater to surface water at concentrations of cadmium, copper, lead, and zinc that exceed surface water PRGs

Table 7.2-2
Preliminary Remediation Goals (PRGs) Established in the Ecological Risk Assessment

Chemical	Soil (mg/kg)	Sediment (mg/kg)	Surface Water Dissolved (µg/L)[a]	Groundwater Dissolved (µg/L)[b]
Arsenic	22	22	NA	NA
Cadmium	2.86	2.86	0.9	0.9
Copper	53	53	1.0	1.0
Lead	175	175	0.66	0.66
Mercury	NA	0.3	NA	NA
Silver	NA	1.1	NA	NA
Zinc	280	280	30	30

based on aquatic plants • not hardness dep. • based on totals

[a] PRGs for cadmium and lead are equal to the ambient water quality criteria, which are dependent on water hardness. The PRGs shown are for a hardness of 30 milligrams per liter, which is typical of the lower range of hardness values in the Coeur d'Alene Basin. The PRGs for copper and zinc are based on protection of aquatic plants.

[b] Groundwater PRGs for cadmium, copper, lead, and zinc are set equal to the surface water PRGs in order to meet the surface water PRGs. No dilution was assumed because metals concentrations in surface water currently exceed PRGs in the Basin.

Notes:

Soil/sediment PRGs reflect the most sensitive receptor or background, whichever is higher. Interim benchmarks will be receptor-specific based on anticipated land use (e.g., agricultural vs. wetland).

NA: not a chemical concern in that medium

Table 7.2-3
Examples of Interim Benchmarks for Protection of Ecological Receptors

Receptor/Medium	Goal	Metrics
Fish and other aquatic organisms	Achieve sustainable fisheries in selected areas (i.e., East Fork Ninemile Creek and Pine Creek) of the Upper Basin	Fish density Number of species Presence of young-of-the-year
Waterfowl	Reduce waterfowl mortality through cleanup of 17% of habitat area	Metal concentrations
Sediment/Surface Water	Reduce transport of particulate lead to floodplains, Coeur d'Alene Lake, and Spokane River through containment or removal of 68% of Lower Basin 100-year floodplain contaminated sediments exceeding 500 mg/kg	Metal concentrations

Table 7.3-1
Potential Chemical-Specific ARARs and TBCs for Ecological Receptors in the Coeur d'Alene Basin

Citation	Federal/ State/Tribal and CSM Unit(s)	Summary of Requirement	Evaluation
Soil			
Model Toxics Control Act regulations (Ch. 173-340 WAC)	Washington CSM Unit 5	Sets forth cleanup levels for soil for residential exposures.	Potentially applicable
MTCA Proposed Ecological Evaluation (Ch. 173-340 WAC)	Washington CSM Unit 5	Provides chemical concentrations that may be used as cleanup levels for ecological sites.	Potential TBC
Surface Water			
Clean Water Act (33 USC 1314); National Toxics Rule (40 CFR 131.36)	Federal All CSM Units	Establishes contaminant thresholds in surface water to protect human health and aquatic organisms. The National Toxics Rule sets forth these standards for states that had failed to fully comply with Section 303(c)(2)(C) of the federal Clean Water Act (CWA).	Potentially applicable when adopted by states and tribes
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Idaho CSM Units 1, 2, and 3	Designates uses for waters of the state and water quality standards protective of those uses. This regulation adopts water quality criteria for individual chemicals based on protection of beneficial uses. April 2000 revisions to regulations have been approved by EPA.	Potentially applicable
Idaho Water Quality Standards and Wastewater Treatment Requirements—Salmonid Sight Feeding Standard (IDAPA 58.01.02.250)	Idaho CSM Units 1, 2, and 3	This standard (50 NT acute and 25 NT chronic above background) is often used to assess the effectiveness of erosion abatement efforts.	Potentially applicable
National Recommended Water Quality Criteria—Correction, April 1999 (USEPA 1999) (Clean Water Act, 33 USC 1314)	Federal All CSM Units	Ambient water quality criteria for protection of human health and aquatic life, developed as guidance for states. Revised in December 1998 to reflect the latest scientific knowledge (corrected in April 1999).	Potentially relevant and appropriate
Total Maximum Daily Load (TMDL) for Coeur d'Alene Basin (USEPA and IDEQ 2000)	Federal CSM Units 1, 2, and 3	Establishes TMDLs for dissolved lead, cadmium, and zinc water-quality-impaired stretches of the Coeur d'Alene basin.	Potential TBC
Washington Surface Water Quality Standards (Ch. 173-201A WAC)	Washington CSM Unit 5	Washington's toxics standard for protection of aquatic life; applicable to all beneficial uses of surface water.	Potentially applicable
Sediment			
Creation and Analysis of Freshwater Sediment Quality Values in Washington State (Cubbage et al. 1997)	Washington CSM Unit 5	Provides numeric freshwater sediment quality values for organics and metals in sediments to be considered as thresholds for detecting biological effects	Potential TBC
NOAA Freshwater Sediment Benchmarks (Buchman 1999)	Federal All CSM Units	NOAA's Screening Quick Reference Tables (SquiRTs) include screening concentrations for inorganics in freshwater sediments.	Potential TBC
Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 1999)	Federal All CSM Units	Used to update PRGs for sediments in CSM Units 1, 2, and 3.	Potential TBC

Table 7.3-1 (Continued)
Potential Chemical-Specific ARARs and TBCs for Ecological Receptors in the Coeur d'Alene Basin

Notes:
ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
CWA - Clean Water Act
FR - Federal Register
IDAPA - Idaho Department of Administration, Administrative Rules
NOAA - National Oceanic and Atmospheric Administration
NTR - National Toxics Rule
OSWER - Office of Solid Waste and Emergency Response
ppm - parts per million
PRGs - preliminary remedial goals
TBC - to be considered
TMDLs - total maximum daily loads
USC - U.S. Code

Table 7.3-2
Potential ARARS for Soil in CSM Unit 5 (State of Washington) (mg/kg)

Metal	MTCA Method B – Residential [a]
Arsenic	1.67
Cadmium	80
Copper	2,960
Mercury	24
Lead	None [b]
Zinc	24,000

[a] Washington State Model Toxics Control Act, Ch. 173-340-740 WAC
[b] There is no Method B value for lead; the Method A value is 250 mg/kg

Notes:
ARARS – applicable or relevant and appropriate requirements
CSM - Conceptual Site Model
MTCA – Model Toxics Control Act

Table 7.3-3
Potential Chemical-Specific ARARs for Groundwater as Drinking Water (µg/L)

Metal	MCL [a]	MCLG
Arsenic	50 [b]	None
Cadmium	5	5
Copper	1,300	1,300 [c]
Lead	15 [c]	Zero
Mercury	2	2
Zinc	None	None

[a] Primary drinking water standards only (secondary standards are for protection of aesthetic qualities of water).
[b] EPA has proposed to lower the MCL for arsenic to 5 µg/L. The proposed MCLG is zero.
[c] Action level at the tap.

Source: USEPA 2000

Table 7.3-4
Potential ARARs for Protection of Aquatic Life in Surface Water in CSM Units 1, 2, and 3

Metal	Federal Ambient Water Quality Criteria[a]						Idaho Water Quality Standards[a]						Coeur d'Alene Tribe Water Quality Standards[a,c]					
	Acute			Chronic			Acute			Chronic			Acute			Chronic		
Hardness[b]	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100
Arsenic	340	340	340	150	150	150	50	50	50	50	50	50	360	360	360	190	190	190
Cadmium	1.2	2.0	4.3	0.9	1.3	2.2	1.0	1.7	3.7	0.40	0.60	1.0	1.0	1.7	3.7	1.0	1.7	1.0
Copper	4.3	7.0	13	3.2	5.0	9.0	5.5	8.9	17	4.06	6.3	11	5.5	8.9	17	5.5	8.9	11
Lead	17	30	65	0.66	1.1	2.5	17.0	30.1	65	0.66	1.2	2.5	17	30	65	0.66	1.1	2.5
Mercury	1.4	1.4	1.4	0.77	0.77	0.77	42	2.1	2.1	0.012	0.012	0.012	2.1	2.1	2.1	0.012	0.012	0.012
Zinc	43	65	120	43	65	120	41	64	110	38	58.1	100	41	64	110	38	58.1	100

[a]Standards and criteria in micrograms per liter (µg/L)
[b]Hardness in milligrams of calcium per liter ($mgCaCO_3/L$)
[c]Tribal ARARs and TBCs apply only on reservation lands.

Notes:

Coeur d'Alene Tribe uses actual hardness for calculations, so if hardness is <25, then tribal standards are more stringent.

These ARARs are also the PRGs for protection of aquatic life in surface water in CSM Units 1, 2, and 3.

Table 7.3-5
Federal Ambient Water Quality Criteria for Dissolved Cadmium, Lead, and Zinc at Measured Hardnesses and Corresponding TMDLs for Specific Water Bodies in the Coeur d'Alene Basin[a]

Target Site	Flow Tier (cfs)	River Hardness (mg/L as $CaCO_3$)	Dissolved Cadmium (µg/L)	TMDL for Dissolved Cadmium (lb/day)	Dissolved Lead (µg/L)	TMDL for Dissolved Lead (lb/day)	Dissolved Zinc (µg/L)	TMDL for Dissolved Zinc (lb/day)
South Fork at Wallace	22	57	0.68	0.0811	1.36	0.162	65	0.00904
	35	56	0.67	0.0127	1.33	0.251	64	0.00339
	79	47	0.59	0.251	1.10	0.467	55	0.0467
	469	25	0.37	0.934	0.54	1.37	32	0.226
Canyon Creek	7	56	0.67	0.0257	1.33	0.0510	64	2.45
	11	56	0.67	0.0398	1.33	0.0790	64	3.79
	25	45	0.57	0.0770	1.05	0.141	53	7.16
	149	25	0.37	0.297	0.54	0.435	32	25.9
Ninemile Creek	2	73	0.82	0.00881	1.78	0.0192	80	0.863
	3	73	0.82	0.0132	1.78	0.0289	80	1.30
	6.9	63	0.73	0.0273	1.52	0.0564	71	2.63
	41	36	0.48	0.107	0.81	0.180	44	9.72
Pine Creek	20	25	0.37	0.0398	0.54	0.0584	32	3.48
	29	25	0.37	0.0578	0.54	0.0846	32	5.05
	80	25	0.37	0.159	0.54	0.233	32	13.9
	387	25	0.37	0.771	0.54	1.13	32	67.4
South Fork at Pinehurst	68	101	1.00	0.381	2.54	0.933	105	38.7
	97	96	1.00	0.523	2.40	1.26	101	52.8
	268	71	0.80	1.16	1.73	2.50	78	113
	1,290	28	0.40	2.80	0.62	4.28	36	247
Coeur d'Alene at Harrison	239	47	0.59	0.760	1.10	1.41	55	71.0
	348	45	0.57	1.07	1.05	1.96	53	99.7
	1,100	36	0.48	2.87	0.81	4.83	44	261
	6,870	25	0.37	13.7	0.54	20.0	32	1,200
Spokane River	NA	20	0.31	None	0.42	None	27	None

Table 7.3-5 (Continued)
Federal Ambient Water Quality Criteria for Dissolved Cadmium, Lead, and Zinc at Measured Hardnesses and Corresponding TMDLs for Specific Water Bodies in the Coeur d'Alene Basin[a]

[a]From USEPA and IDEQ 2000.

Notes:
cfs - cubic feet per second
lb - pounds
µg/L - micrograms per liter
mg/L - milligrams per liter
TMDL - total maximum daily load

Table 7.3-6
Potential Surface Water ARARs for Protection of Human Health in CSM Unit 5 (State of Washington)

	Federal Ambient Water Quality Criteria		Washington Water Quality Standards[c]		Spokane Tribe Water Quality Standards	
Metal	Water & Organisms (µg/L)	Organisms Only (µg/L)	Water & Organisms (µg/L)	Organisms Only (µg/L)	Water & Organisms (µg/L)	Organisms Only (µg/L)
Arsenic	0.018[a]	0.14[a]	0.018	0.14	0.018	0.14
Cadmium	[b]	[b]	[d]	[d]	[e]	[e]
Copper	1,300	[b]	Nav	Nav	[e]	[e]
Lead	[b]	[b]	[c]	[c]	[e]	[e]
Mercury	0.050	0.051	0.14	0.15	0.14	0.15
Zinc	9,100	69,000	Nav	Nav	[e]	[e]

[a] EPA is currently reassessing the criteria for arsenic. Upon completion of the reassessment the agency will publish revised criteria as appropriate.
[b] EPA has not calculated a human health criterion for this contaminant.
[c] According to WAC 173-201-040(5), human-health-based water quality criteria used by the State and contained in the National Toxics Rule (40 CFR 131.36).
[d] EPA has not promulgated a human health criterion for this contaminant.
[e] The Spokane Tribe has not promulgated a human health criterion for this contaminant.

Note:
Nav - Not available.

Table 7.3-7
Potential ARARs for Protection of Aquatic Life in Surface Water in CSM Unit 5
(State of Washington)

Metal	Federal Ambient Water Quality Criteria[a]						Washington Water Quality Standards[a]						Spokane Tribe Water Quality Standards[a]					
	Acute			Chronic			Acute			Chronic			Acute			Chronic		
Hardness[b]	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100
Arsenic	340	340	340	150	150	150	360	360	360	190	190	190	360	360	360	190	190	190
Cadmium	1.2	2.0	4.3	0.9	1.3	2.2	1.0	1.7	3.7	0.40	0.60	1.0	1.0	1.7	3.7	0.40	0.60	1.0
Copper	4.3	7.0	13	3.2	5.0	9.0	5.5	8.9	17	4.06	6.3	11	5.5	8.9	17	4.06	6.3	11
Lead	17	30	64	0.66	1.1	2.5	17.0	30.1	65	0.66	1.2	2.5	17.0	30.1	65	0.66	1.1	2.5
Mercury	1.4	1.4	1.4	0.77	0.77	0.77	2.1	2.1	2.1	0.012	0.012	0.012	2.1	2.1	2.1	0.012	0.012	0.012
Zinc	43	65	117	43	65	117	41	64	110	38	58.1	100	41	64	110	38	58.1	100

[a] Standards and criteria in micrograms per liter (µg/L)
[b] Hardness in milligrams of calcium per liter ($mgCaCO_3/L$)

Note: These potential ARARs are also the PRGs for protection of aquatic life in surface water in CSM Unit 5.

Table 7.3-8
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Federal (All CSM Units)		
American Indian Religious Freedom Act (42 USC 1996 et seq.)	Protects religious, ceremonial, and burial sites and the free practice of religions by Native American groups.	Potentially applicable
Native American Graves Protection and Repatriation Act (25 USC 3001 et seq., 43 CFR 10)	Protects Native American burial sites and funerary objects. If Native American graves are discovered within remediation areas, project activities must cease and consultation must take place between the Department of Interior and the affected tribe.	Potentially applicable
National Historic Preservation Act [16 USC 470 et seq.; 36 CFR Parts 60, 63, 800; 40 CFR 6.301(b)]	Federal agencies must identify possible effects of proposed remedial activities on historic properties (cultural resources). If historic properties or landmarks eligible for, or included in, the National Register of Historic Places exist within remediation areas, remediation activities must be designed to minimize the effect on such properties or landmarks.	Potentially applicable
Archeological and Historic Preservation Act [16 USC 469 et seq., 40 CFR 6.301(c)]	Establishes procedures to provide for preservation of historical and archaeological data that might be destroyed through alteration of terrain as a result of federal construction project or a federally licensed activity or program.	Potentially relevant and appropriate if site contains historical or archaeological data. Presence or absence of such data on the site must be verified. If historical or archaeological artifacts are present in remediation areas, the remedial actions must be designed to minimize adverse effects on the artifacts.
Migratory Bird Treaty Act (16 USC 703 et seq.)	Protects all species of native, nongame migratory birds from taking without a permit (e.g., lead poisoning of waterfowl due to sediment ingestion). Hunting of migratory birds under a license is a regulated taking.	Potentially relevant and appropriate
Bald and Golden Eagle Protection Act (16 USC 668; 50 CFR 22)	Provides for the protection of the bald eagle and the golden eagle by prohibiting the unpermitted taking, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg [16 USC 668(a); 50 CFR 22]. "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb [16 USC 688(c); 50 CFR 22.3].	Potentially relevant and appropriate
Rivers and Harbors Act of 1899 (33 USC 401 et seq.; 33 CFR 320-330)	Prohibits unauthorized obstruction or alteration of navigable waters.	Potentially applicable

Table 7.3-8 (Continued)
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Federal (All CSM Units) (Continued)		
Clean Water Act (Section 404) - Dredge or Fill Requirements (33 USC 1251-1376; 33 CFR Parts 320-330; 40 CFR Part 230)	Establishes requirements that limit the discharge of dredged or fill material into navigable waters and associated wetlands. EPA guidelines for discharge of dredged or fill materials in 40 CFR Part 230 specify consideration of alternatives that have less adverse impacts and prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardy of threatened or endangered species. Special consideration required for "special aquatic sites" defined to include wetlands.	Potentially applicable. Certain proposed alternatives may result in the temporary or permanent loss of or damage to existing wetlands through dredging and filling activities.
Protection of Wetlands [Executive Order 11990; 40 CFR 6.302(a); 40 CFR Part 6, Appendix A]	Requires federal agencies to take action to avoid adversely impacting wetlands, to minimize wetland destruction, and to preserve the value of wetlands. Also provides for wetlands enhancement and restoration.	Potentially applicable.
Considering Wetlands at CERCLA Site Guidance (OSWER 9280.03, May 1994)	Provides guidance for considering potential impacts of response actions on wetlands at CERCLA sites.	Potential TBC
Protection of Floodplains [Executive Order 11988; 40 CFR 6.302(b); 40 CFR Part 6, Appendix A]	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain.	Potentially applicable where tailings and other wastes are located within the 100-year floodplain.
RCRA: Location Standards for Hazardous Waste Facilities-100 Year Floodplains [42 USC 6901; 40 CFR 264.18(b)]	Hazardous waste treatment, storage, or disposal facilities (TSDFs) located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any 100-year floodplain.	Potentially relevant and appropriate
Idaho (CSM Units 1, 2, and 3 only)		
Idaho Water Quality and Wastewater Treatment—Hazardous and Deleterious Material Storage [Idaho Statute 39-105 and 39-3601 et seq.; IDAPA 58.01.02.800]	Hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters unless adequate measures and controls are provided to ensure that those materials will not enter state waters as a result of high water, precipitation runoff, wind, storage facility failure, accidents in operation, or unauthorized third party activities.	Potentially applicable

Table 7.3-8 (Continued)
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Idaho (CSM Units 1, 2, and 3 only) (Continued)		
Idaho Siting of Hazardous Waste Disposal Facility (Idaho Code 39-5801 et seq.) and Idaho Rules and Standards for Hazardous Waste (IDAPA 58.01.05)	The remedial action will be designed to satisfy some of the technical criteria in the Idaho Hazardous Waste Siting Management Plan as adopted by the Idaho Legislature. Consideration will be given in remedy design to general considerations referenced by the Hazardous Waste Facility Siting Act. However, a siting license for an on-site hazardous waste disposal facility is not required.	Potentially relevant and appropriate
Idaho Lakes Protection Act [Idaho Code 58-104(9) and 58-1301 et seq.; IDAPA 20.03.04]	Requires that the protection of property, navigation, fish and wildlife habitat, aquatic life, recreation, aesthetic beauty and water quality be given due consideration and weighed against the navigational or economic justification for encroachments of beds or waters of navigable lakes of the state	Potentially applicable
Idaho Classification and Protection of Wildlife (Idaho Statute 36-201 and IDAPA 13.01.06)	The Idaho Department of Fish and Game classifies wildlife as game, protected non-game, endangered, threatened, and species of special concern. None of the protected non-game, species of special concern, threatened, or endangered species may be taken or possessed, except as provided by Idaho Fish and Game.	Potentially relevant and appropriate
Idaho Preservation of Historical Sites (Idaho Statute 67-4601 et seq.) and Idaho State Historical Society (Idaho Statute 67-4101 et seq.)	Covers historical sites and historical districts within the state of Idaho and the excavation of archaeological resources. The Idaho State Historical Society is a state agency. It publishes the National Register of Historic Places for Idaho.	Potentially applicable.
Washington (CSM Unit 5 only)		
Washington Shoreline Management Act (Ch. 90.58 RCW; Ch. 173-18, Ch. 173-22, Ch. 173-27 WAC)	Activities within 200 feet of a shoreline of the State with a value of over $2,500 must meet certain requirements.	Potentially applicable
Washington Game Code (Ch. 77-12 RCW; WAC 232-12)	Sets forth state endangered, threatened, sensitive, and other protected species.	Potentially relevant and appropriate
Washington Model Toxics Control Act (Ch. 70.105 RCW; Ch. 173-340 WAC)	Provides cleanup levels for soil, groundwater, surface water; addresses institutional controls.	Potentially applicable
Washington Clean Water Act (Ch. 90.48 RCW; WAC 173-201A)	Provides surface water quality standards for waters of the state.	Potentially applicable

Table 7.3-8 (Continued)
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Washington (CSM Unit 5 only) (Continued)		
Washington Aquatic Lands Management Act (Ch. 79.90.455 RCW; Ch. 332-30)	Contains use authorization and environmental protection requirements for aquatic lands	Potentially applicable
Washington Hydraulics Project Approval (Ch. 75.20.100-160 RCW; Ch. 220-110 WAC)	Requires approval for activities that could affect the flow of waters of the state.	Potentially applicable
Coeur d'Alene Tribe (CSM Unit 3 only)		
Shoreline Protection Act [CDA 25(98), CES Sec. 4[a]]		Potentially applicable, or TBC?

[a] Tribal ARARs and TBCs apply only on reservation lands.

Notes:
ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
Ch. - Chapter
FR - Federal Register
IDAPA – Idaho Department of Administration, Administrative Rules
RCRA - Resource Conservation and Recovery Act
RCW - Revised Code of Washington
TBC - to be considered
USC - U.S. Code
USFWS - U.S. Fish and Wildlife Service
WAC - Washington Administrative Code

Table 7.3-9
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
RCRA Subtitle C—Exemption for Processing and Beneficiation Mining Waste [40 CFR 261.4(b)(7)]	EPA exempts mining wastes as solid waste from the extraction, beneficiation, and processing of ores and minerals, in accordance with the Bevill amendment to RCRA.	Potentially applicable.
RCRA Subtitle C—Hazardous Waste Characteristics (40 CFR 261.20)	Generators of solid waste must determine whether the waste is hazardous. A solid waste is hazardous if it exhibits the toxicity characteristic (based on extraction procedure Method 1311).	Potentially applicable.
RCRA Subtitle C—Hazardous Remediation Waste Management Requirements (HWIR-Media) (40 CFR 264.554)	The use of staging piles can facilitate short-term storage of remediation wastes so that sufficient volumes can be accumulated for shipment to an off-site treatment facility or for efficient on-site treatment. The regulations contain performance standards for these piles.	If contaminated media hazardous waste, potentially applicable; if not, potentially relevant and appropriate.
RCRA Subtitle C—Hazardous Waste Treatment and Storage (40 CFR 264)	Requirements for storing or treating hazardous wastes in tanks, containers, or surface impoundments. Subpart F addresses groundwater monitoring at hazardous waste treatment, storage, or disposal facilities (TSDFs). Closure requirements for hazardous waste repositories are covered under Subpart G. Hazardous waste landfills must meet minimum design standards under Subpart N.	Potentially relevant and appropriate.
RCRA Subtitle C—Treatment Standards for Hazardous Waste Debris (40 CFR 268.45)	Hazardous debris must be treated through identified technologies or standards, unless EPA determines that debris is no longer contaminated, pursuant to 40 CFR 261.3(e)(2)	Potentially applicable
Idaho Rules and Standards for Hazardous Waste-Management of Hazardous Waste (IDAPA 58.01.05 et. seq.) and Land Disposal Restrictions (IDAPA 58.01.05.011)	Hazardous wastes that are generated must be managed in accordance with the generation, and transportation, storage and disposal requirements. LDRs place specific requirements (concentration or treatment) on RCRA hazardous wastes prior to their placement in a land disposal unit.	Potentially relevant and appropriate if any material accumulations are treated ex situ.
RCRA Subtitle D—RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices (42 U.S.C. 6901 et seq.; 40 CFR 257)	Certain criteria are required to be met by solid waste disposal facilities and practices, such as not restricting the base flow of the floodplain, not taking threatened or endangered species, and not causing a discharge to waters of the U.S.	Potentially relevant and appropriate

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
RCRA Subtitle D—Disposal of Nonhazardous Solid Waste (42 U.S.C. 6901 et seq.; 40 CFR Part 258)	Provides criteria for cover material, run-on/run-off control systems, access control, liquid restrictions.	Potentially relevant and appropriate requirement.
Idaho Solid Waste Management Rules and Standards (IDAPA 58.01.06)	Requires all solid waste be managed to prevent human health hazards, public nuisances, or pollution of environment. Elements relating to landfill cover, surface water management, and erosion control may be ARARs.	Potentially applicable or relevant and appropriate.
Mine and Mill Waste Remedial Guidelines and Best Management Practices (CDA Basin Restoration Project)	Design and implementation of selected response actions should consider a number of factors and techniques for protecting water quality, fish and wildlife habitat, while minimizing potential for human exposure.	Potential TBC
Best Management Practices and Guidelines for Mine Tailings Repositories	Provides guidelines for location, design, construction, and management of mine waste repository	Potential TBC
Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 U.S.C. 1201 et seq., 30 CFR 816)	Requires the protection of human health and the environment from the adverse effects of current and past surface coal mining operations. Some of the potentially relevant and appropriate requirements for the removal of contaminated surface soils include: -Stabilization of all exposed surface areas to effectively control erosion and air pollution attendant to erosion (30 CFR 816.95). -Use of best technology currently available to 1) minimize disturbances to and adverse impacts on fish, wildlife, and related environmental values and to achieve enhancement of such if possible; 2) conduct no activity that may jeopardize continued existence of endangered species or that is likely to destroy or adversely modify their critical habitat; and 3) avoid disturbances to, enhance where practicable, or restore or replace wetlands, riparian vegetation, and habitats for fish and wildlife (30 CFR 816.97).	Potentially relevant and appropriate. Although coal mining did not occur in the Coeur d'Alene basin, SMCRA requirements may be relevant and appropriate for cleanup of other types of mining sites.
Idaho Rules Governing Exploration and Surface Mining—Best Management Practices, Reclamation (IDAPA 20.03.02.060, .140, .160)	Reclamation requirements include best management practices for protection of water quality, non-point sediment control, clearing and grubbing operations, overburden and topsoil requirements to enhance revegetation of disturbed areas, and road construction requirements to minimize erosion. Additional best management practices are specified for backfilling and grading and revegetation activities.	Potentially relevant and appropriate.

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Best Management Practices for Soils Treatment Technologies (EPA Office of Solid Waste and Emergency Response, 1997)	Provides technologies for controlling cross-media transfer of contaminants during materials handling activities.	Potential TBC during excavation or contamination of contaminated soils
Mine and Mill Waste Removal Guidelines and Best Management Practices (Coeur d'Alene Basin Restoration Project)	Design and implementation of selected response actions should consider a number of factors and techniques for protecting water quality, fish and wildlife habitat, while minimizing potential for human exposure.	Potential TBC for cleaning up mine wastes in Coeur d'Alene River Basin.
Best Management Practices and Guidelines for Mine Tailings Repositories (Coeur d'Alene Basin Restoration Project, April 27, 1995)	Guidelines for locating design, construction and management of mine waste repository	Potential TBC for the disposal of mining waste in the Coeur d'Alene River Basin
Idaho Mine Tailings Impoundment Structure Rules (IDAPA 37.03.05)	Design elements of the regulation may be relevant and appropriate to construction of regional repositories. Construction, enlargement, and alteration of mine tailings impoundments must conform to specific design specifications, spillways or diversion structures, cutoff walls, filters, and embankment slopes.	Potentially relevant and appropriate.
Coeur d'Alene Tribe Stream Channel Protection Act (CDA 25(98),[a] CES Sec. 4.4); Idaho Stream Channel Alteration Rules (IDAPA 37.03.07)	Contains design standards for work within stream channels, including remedial activities that involve channel alteration.	Potentially applicable

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Clean Water Act/Water Pollution Control Act (33 U.S.C. 1251) Effluent Limitations (Sections 301-302) Water Quality Standards (Section 303) Federal Water Quality Criteria (Section 304) National Performance Standards (Section 306) Toxic and Pre-Treatment Standards (Section 307) National Pollutant Discharge Elimination System (Section 402)	These regulations govern water quality, including water discharged as part of a remedial process. Section 307—Pretreatment regulations under 40 CFR Part 403 provide for limits on discharge to a sanitary sewer system, protecting the municipal system from accepting wastewater that would cause it to exceed its NPDES permit discharge limits. Section 401—Water Quality Certification requires that EPA receive a water quality certification from a state that a given project requiring a federal permit that may result in a discharge to navigable water will comply with the state's water quality standards. Section 402—NPDES establishes a comprehensive framework for addressing stormwater discharges under the NPDES program. Specifies requirements under 40 CFR 122.26 for point source discharge of stormwater from construction sites to surface water and provide for Best Management Practices such as erosion control for removal and management of sediments to prevent run-on and run-off.	Potentially applicable or relevant and appropriate.
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Restrictions are placed on the discharge of wastewaters and on human activities that may adversely affect water quality in state waters. Under IDAPA 58.01.02.800, hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters unless adequate measures and controls are provided to ensure that those materials will not enter state waters. Deleterious materials are defined as any nontoxic substances that may cause the tainting of edible species of fish, taste and odors in drinking water supplies, or the reduction of the usability of water without causing physical injury to water users or aquatic and terrestrial organisms. Nonpoint source activities conducted in a manner that demonstrates a knowledgeable and reasonable effort to minimize resulting adverse water quality impacts are not subject to conditions or legal actions (IDAPA 58.01.02.350.02.a).	Potentially applicable.

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Idaho Non-Point Source Management Plan, Final (December 1999)	Remedial activities should be consistent with the state's goal of restoration, maintenance and protection of the beneficial uses of both surface water and groundwater. Long-term goals include design and implementation of BMPs for surface water and groundwater.	Potential TBC.
Federal Clean Air Act (42 U.S.C. 7401 et seq.)	Requires minimization of the harmful effects to air quality from excavation, construction, and other removal activities.	Potentially applicable or relevant and appropriate.
Idaho Air Pollution Control Rules (IDAPA 58.01.01)	Requires that remedial activities be designed to take all reasonable precautions to prevent particulate matter from becoming airborne, including the use of water or chemicals as dust suppressants, the covering of trucks, and the prompt removal and handling of excavated materials.	Potentially applicable.
Idaho Asbestos Statute	Any asbestos-containing materials encountered in mill demolition must be removed and disposed of in accordance with these regulations.	Potentially applicable
Idaho Land Remediation Rules (IDAPA 58.01.18.027)	Institutional controls may be used in instances where residual concentrations of chemicals exceed risk-based health standards, or when they are required to assure the continued protection of human health and the environment or the integrity of the cleanup action.	Potentially applicable.
Federal Hazardous Materials Regulations (49 CFR Parts 171 to 180)	The movement of hazardous materials on public roadways must follow the placarding, packaging, documentation, and other requirements of this U.S. Department of Transportation regulation. Regulation also establishes emergency response/reporting procedures.	Potentially applicable.
Idaho Property Condition Disclosure Act (Idaho Statute 55-2506)	Idaho Statute 55-2506 requires the disclosure by sellers of residential real property of the known presence of hazardous materials or substances.	Potential TBC for institutional control activities that involve the publication/ distribution of environmental data.
Washington Clean Water Act (Ch. 90.48 RCW; Ch. 173-216, 220)	Discharges from a point source to waters of the state must meet surface water quality standards.	Potentially applicable.
Washington State Board of Health (Ch. 43.20 RCW; Ch. 246-290 WAC)	Protects public drinking water supplies and establishes maximum contaminant levels for drinking water.	Potentially relevant and appropriate
Washington Hazardous Waste Management Act (Ch. 70.105 RCW) and dangerous waste regulations (Ch. 173-303 WAC)	Provides requirements for the identification, accumulation, transport, treatment, and disposal of dangerous (including federally hazardous) wastes.	Potentially relevant and appropriate

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Washington Solid Waste Management Act (Ch. 70.95 RCW); and minimum functional standards for solid waste handling (Ch. 173-304 WAC) and criteria for municipal solid waste landfills (Ch. 173-351 WAC)	Sets forth standards for siting and design of solid waste landfills. Specific standards may be ARARs for disposal of contaminated soil and sediments.	Minimum functional standards potentially applicable; municipal solid waste landfill regulations potentially relevant and appropriate
Washington Clean Air Act (Ch. 70.94 RCW; Ch. 173-400, 460 WAC)	Discharges from treatment units must meet acceptable source impact levels (ASILs) at the property boundary. Generation of fugitive emissions is also regulated.	Potentially relevant and appropriate.
Washington Water Well Construction Act (Ch. 18.104 RCW; Ch. 173-160 WAC)	Should monitoring wells need to be constructed to assess groundwater quality, these technical standards would be potential ARARs	Potentially applicable
Idaho Evidence Public Writings Records Exempt From Disclosure - Personnel Records, Personal Information, Health Records, Professional Discipline [Idaho Statute 9-340C(6)]	Records of a personal nature related directly or indirectly to the application for and provision of statutory services rendered to persons applying for participation in an environmental or a public health study are exempt from disclosure [Idaho Statute 9-340C(6)]. To the extent required by the Federal Clean Air Act and RCRA for state primacy over any delegated or authorized programs, even if the record is otherwise exempt from disclosure under section 9-340 Idaho Code, any person may inspect and copy any other record unless the record is a trade secret [Idaho Statute 9-342A(1)(d)].	Potential TBC for institutional control activities that involve the publication/ distribution of environmental data.

[a] Tribal ARARs and TBCs apply only on reservation lands.

Notes:
ARAR - applicable or relevant and appropriate requirement
BMPs - best management practices
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
EPA - U.S. Environmental Protection Agency
FR - Federal Register
IDAPA - Idaho Department of Administration and Administrative Rules
IDHW - Idaho Department of Health and Welfare
LDR - Land Disposal Restriction
NPDES - National Pollutant Discharge Elimination System
RCRA - Resource Conservation and Recovery Act
TBC - to be considered

8.0 DESCRIPTION OF ALTERNATIVES

In the FS, alternatives were developed for a comprehensive, basin wide remedy. However, due to costs and complexity, it is likely that the preferred comprehensive remedy would be implemented in phases. Phasing implementation causes difficulty in determining what subparts to prioritize first, especially as concerns ecological risks. To simplify the alternatives evaluation process and ensure that the alternatives meet threshold criteria for the Basin (i.e., Alternatives 2 through 4), the alternatives evaluation is performed Basin wide. However, each alternative actually consists of more than 1,100 individual source decisions as to what specific remedial technology would best apply. Generally, source areas can be classified into the following categories:

- CSM Units 1 and 2 - Upper Basin
  - Adits
  - Tailings-impacted floodplain sediments in the current and historic 100-year floodplain
  - Unimpounded tailings piles
  - Impounded tailings piles at inactive facilities
  - Impounded tailings piles at active facilities
  - Waste rock piles in 100-year floodplains
  - Waste rock piles outside 100-year floodplains

- CSM Unit 3 – Lower Basin
  - Riverbed sediments
  - Banks and levees
  - Wetland sediments
  - Lake sediments
  - Other 100-year floodplain sediments
  - Cataldo/Mission Flats dredge spoils

- CSM Unit 4 – Lake Coeur d'Alene
  - Lakebed sediments

- CSM Unit 5 – Spokane River
  - Sediments

Because of the complexities associated with developing comprehensive remedial alternatives for the site, including inherent differences between human health and ecological exposure pathways, two concurrent efforts were used. These efforts have resulted in two complementary sets of remedial alternatives:

- **Alternatives to protect human health**—Human health alternatives for the Coeur d'Alene River Basin were developed for four environmental media: soil (five alternatives), drinking water (six alternatives), house dust (three alternatives), and fish consumption (3 alternatives). The human health alternatives for each medium were assembled independently of the other media to allow maximum flexibility in future decision making, including integration with the ecological alternatives, as developed in the second effort.

- **Alternatives to protect the environment**—Selected ecological alternatives may also have a beneficial impact on human health in addition to the environment. However, the emphasis here is on the environmental or ecological component. Reflecting a comprehensive approach, the ecological alternatives were assembled to deal with both "local" site-specific effects and "global" site-wide effects. Six alternatives were developed for the Coeur d'Alene River Basin, two alternatives were developed for Coeur d'Alene Lake, and five alternatives were developed for selected sites in Washington along the upper Spokane River.

The alternative development process for both human health and ecological protection included identification of all potentially applicable technologies and process options; screening of technologies and process options on the basis of technical implementability only; and evaluation and screening of retained technologies and process options based on effectiveness, implementability, and cost. The retained process options were then assembled into alternatives that cover a range of remedial options, including "no action," as required by the NCP.

The remedial alternatives are not mutually exclusive choices and do not limit the choice of a remedy. The preferred alternative can combine elements of the various alternatives, refine or modify those elements, or add to them. The remedial alternatives have been developed to a planning level of detail, not a design level of detail. Any remedial actions would require a site-specific remedial design.

Cleanup plans for the basin have also been developed by the State of Idaho (State of Idaho Cleanup Plan) and the mining companies (Mining Companies Cleanup Plan). Because the ecological components of these plans enhance the range of remedial options available to decision makers, these plans are presented as ecological Alternatives 5 (State plan) and 6 (mining companies plan), based on interpretation of available documentation. The human health alternatives include the human health components of these plans, with minor exceptions, and the State plan and mining companies plan are not presented as distinct alternatives.

8.1 HUMAN HEALTH ALTERNATIVES

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

- Soil

- Drinking water
- House dust
- Fish consumption

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

8.1.1 Soil Alternatives

Soil Alternative S1—No Action

This alternative would leave contaminated soil in place with no change in existing conditions. It would not remove contaminated soil from residential yards and gardens in the basin, it would provide no information, education, or counseling for residents with contaminated yards, and it would not monitor blood lead levels to evaluate the impacts of continued exposure. The no action alternative provides a baseline from which to compare the action alternatives.

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. Services also include biological monitoring, yard and home sampling, and nursing follow-up services. An institutional controls program which would include local construction regulations (developed and implemented in conjunction with local zoning, building, or planning commissions) may also be considered in certain areas if risk conditions warrant.

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 at 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. Where appropriate, exteriors of structures would be

pressure-washed before remedial measures are performed, to reduce the potential for recontamination from lead-based paint. Risk would be further reduced by installing visual markers to delineate the limits of soil removal. In addition to residential yards, common use areas such as streets, alleys, rights-of-ways, and playgrounds would also be candidates for remediation if soil contamination and exposure risks warrant. This alternative would also include revegetation and interim dust control during soil excavation. 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, 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 and dispose of soil that exceeds action levels. 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. If warranted, exteriors of structures would be pressure-washed to reduce the potential for recontamination from lead-based paint. This alternative would include backfilling the properties with clean soil to reestablish site grades and revegetating the reclaimed ground surface. It would also include interim dust control during soil excavation. This alternative is not envisioned for recreational areas.

8.1.2 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. It would take no action to prevent exposure to COPCs in drinking water, and would provide no information or education to exposed residents. The no action alternative provides a baseline from which to compare the action alternatives.

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. Because this alternative would require an ongoing effort, it is considered primarily for use at the community level and is generally not considered feasible for individual residences, except for raising general awareness of risks.

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. Filters would be placed at each tap or other point of use in residences. If possible, a single filter would be placed on the main residence service line to

avoid potential confusion and change-out costs for multiple filters. A change-out program would be required to ensure that filters are changed on the required schedule.

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. Information programs would be used to better inform residents about lead risks from in-home plumbing.

Drinking Water Alternative W5—Public Information and Alternative Source, Groundwater

For properties currently supplied by contaminated water 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. The suitability of the alternative aquifer (for example, water yield and quality) would need to be evaluated before drilling any new wells. After well construction, groundwater sampling would be conducted to verify that new wells supply water capable of achieving the RAOs. Subsequent monitoring would also be conducted to ensure continual achievement of RAOs. Information programs would be used to better inform residents about lead risks from in-home plumbing.

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 individual residences or common areas with a hookup to the existing public conveyance system. For areas outside water districts (mostly in the tributary gulches), it is assumed that public water utilities will 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. Alternative W6 would include a survey of residences during remedial design to determine whether they were served by public water utilities, and to determine residences at which COPCs in drinking water exceed maximum contaminant levels.

8.1.3 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. It would take no action to prevent exposure, and provide no information or education to exposed residents. The no action alternative provides a baseline from which to compare the action alternatives.

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 PHD's Lead Health Intervention Program at the BHSS 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. Monitoring would also be conducted to ensure continued achievement of RAOs.

House Dust Alternative D3—Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Contingency 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 which provide a source for recontamination. Interior cleaning would include a one-time cleaning of hard surfaces and heating and cooling systems and removal and replacement of major interior dust sources such as carpet and some soft furniture. These activities would occur only after exterior sources of contamination had been permanently remediated, to ensure cost-effectiveness and prevent recontamination. Based on observations from yard remediation in the BHSS, once exterior yard soil is cleaned up, relatively few homes (a maximum of 20 percent of the homes that required yard cleanup, or about 100 to 200 homes) are expected to require the additional interior cleaning provided by Alternative D3. In addition, this alternative would consider crawl spaces, attics, and basements. Contaminated crawl spaces would be capped with a sand or synthetic cover to prevent generation of dust and tracking of soil into the home. Accessible attics and basements would also be cleaned. The exact scope of this alternative will depend on the conditions of each residence. Temporary relocation of residents might be required during cleaning to protect their safety. Monitoring would also be conducted to ensure that RAOs continue to be achieved after the remedy is implemented.

8.1.4 Fish Consumption Alternatives

Fish Consumption 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. It would take no action to prevent exposure and provide no information or education to people likely to consume contaminated fish. The no action alternative provides a baseline from which to compare the action alternatives.

Fish Consumption 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 of the potential health risk of consuming contaminated fish caught in waterways and wetlands. All printed materials, press releases, and public meetings developed to inform the public of basin metals issues would include information about the fish risks, how to reduce exposure, prevention, and other pertinent issues. Fish hazard information programs would be expanded to the Coeur d'Alene Indian Reservation communities, as appropriate, to ensure that Tribal members are kept informed. Targeted community education programs would be implemented in Benewah, Kootenai, and Shoshone Counties. A well-maintained signage program to educate fishermen and other water users of metals hazards would be implemented at all river/lake access sites and common use areas, including the Coeur d'Alene River Trail system corridor. Idaho Department of Fish and Game, Idaho State Parks, USFS, and BLM field personnel who regularly contact basin fishermen and recreational users would be trained in metals risk management and supplied with appropriate pamphlets and signs.

Fish Consumption Alternative F3—Information and Intervention and Monitoring

This alternative would build on the efforts of informing and educating fishermen of risks 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 trained seasonal "river ranger" program 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.

8.2 ECOLOGICAL ALTERNATIVES

A range of comprehensive alternatives, designed to achieve compliance with regulations and long-term protection of the environment to the extent possible, were developed in the FS. In comparison to human health, the FS showed that the long-term goals, such as surface water quality standards and compliance with soil/sediment PRGs, will be difficult to achieve throughout the Basin given the extent of contamination.

While the alternatives described in this section are comprehensive in nature, it is recognized that an incremental approach would likely be used to implement an ecological remedy, due to both cost and complexity. A number of benefits could be realized by using a phased implementation approach.

- Cost, environmental, and socio-economic impacts would be moderated.
- Observable results could be achieved within a relatively short time in the areas addressed in the initial phase.
- The results of remedy implementation could be monitored to improve the effectiveness of subsequent remedial activities.
- Opportunities would exist for innovative, cost-effective technologies to evolve over time.

The general response actions for the ecological FS are shown in Table 8.2-1. These are further divided into process options, which are depicted in Table 8.2-2. The application of a specific process option is dependent upon source specific circumstances.

Figures 8.2-1 through 8.2-15 provide illustrations of selected typical conceptual designs (TCDs). Table 8.2-3 describes the purposes and application criteria for the selected TCDs.

8.2.1 Upper and Lower Basin

Six ecological alternatives have been developed for the Upper and Lower Basin.

- 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

Remedial actions were identified for various contamination sources under each of the alternatives. Table 8.2-4 describes the generalized approach each alternative takes to remediating source types. However, to better describe how this is applied at the watershed and source level, Tables 8.2-5, 8.2-6, and 8.2-7 show the proposed remedial actions by source and waste type for a typical area, i.e., Ninemile Creek.

Estimated unit costs for each of the TCD groups are presented in Tables 8.2-8 and 8.2-9. Alternative 5 and 6 TCDs and estimated unit costs are listed in Tables 8.2-10 and 8.2-11, respectively. Alternatives 5 and 6 were developed by the State and mining companies, respectively. The TCDs associated with these alternatives vary in design details from the TCDs used to develop Alternatives 2, 3, and 4. As a result, the unit costs are different. The unit costs for Alternatives 2, 3, and 4 are also presented for the example Ninemile Creek remediation shown in Tables 8.2-5 through 8.2-7.

For the purpose of comparing the effectiveness of the six alternatives, estimates were made of the reduction in zinc concentrations at completion of remedy implementation and the time needed to attain the AWQC for zinc, including natural recovery (URSG 2001). The estimates were made for the South Fork at Pinehurst, and assume that AWQC are achieved for sources within the BHSS. The results are shown in Table 8.2-12. Alternative 4 is estimated to result in the lowest zinc concentration following remedy implementation and the shortest time to achieve ARARs. Alternative 3 is predicted to result in about a 40 percent higher zinc concentration and about a 50 percent longer time to achieve zinc AWQC compared to Alternative 4. Alternative 2 is predicted to result in about a 190 percent higher zinc concentration and about a 140 percent longer time to achieve zinc AWQC compared to Alternative 4. Alternatives 5, 6, and 1 result in increasingly higher zinc concentrations and longer times to achieve zinc AWQC.

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 and metal transport via erosion and leachate loading to groundwater and surface water. Bioengineering would be used to provide bank and stream stabilization, control erosion of contaminated sediments, and support natural recovery of riverine and riparian habitat. Chemical 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). Residual risks would be associated with contaminated media left in place or only partially contained.

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:

- Regional repositories in the Upper Basin
- A regional active water treatment plant
- More extensive use of hydraulic isolation, including inaccessible current and historic 100-year floodplain sediments and additional tailings impoundments in the Upper Basin

Disposal of materials removed from the Lower Basin (including river banks, levees, and beds; wetlands; and lateral lakes) would be at a regional repository or by confined aquatic disposal (CAD).

Alternative 4—Maximum Removal, Disposal, and Treatment

Alternative 4 would include removal of sources to the maximum practical extent with disposal in regional repositories. It would extend the use of active water treatment, and inaccessible current

and historic 100-year floodplain sediments 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 practicable.

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 repositories and passive water treatment, but does not include an active water treatment plant. In developing the alternative, IDEQ sought to achieve a balance between benefit, cost, and impact to the environment in both the long term and short term.

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 repositories and active water treatment plants are not included.

8.2.2 Coeur d'Alene Lake

Based on currently available information, as described in Section 6.3, there does not appear to be adequate technical justification for active remediation (e.g., dredging, capping) of lakebed sediments. Two alternatives were developed for Coeur d'Alene Lake.

- Alternative 1—No Action
- Alternative 2—Institutional Controls

Alternative 1—No Action

The no action alternative is developed here to provide a basis for comparing existing and future environmental impacts that would be present if no remedy is implemented in Coeur d' Alene Lake. Alternative 1 would include monitoring.

Alternative 2—Institutional Controls

This alternatives includes institutional controls such as signage, monitoring and implementation of the Lake Management Plan (Coeur d'Alene Tribe et al. 1996). The latter is summarized in the following paragraphs.

A lake management study was initiated in 1991. One of the objectives of this study was to develop a lake management plan that would identify actions needed to achieve water quality goals. It was not deemed appropriate to apply a single water management strategy to the entire lake, therefore, the lake was divided into the following four water quality management zones:

- **Nearshore** (water depths less than 20 feet)
- **Shallow, southern lake** (south of the mouth of the Coeur d'Alene River and including the shallow lakes such as Benewah, Chatcolet, Hidden, and Round)
- **Lower rivers** (lower reaches of the St. Joe and Coeur d'Alene Rivers that are affected by backwater from the lake)
- **Deep, open water** (north of the mouth of the Coeur d'Alene River)

Management goals for the nearshore zone primarily involve implementation of best management practices to control erosion from watersheds that feed the lake. Residential and municipal sewer systems will also be addressed to reduce nutrient loadings entering the lake from these sources.

In the shallow, southern lake, best management practices would also be employed to reduce sediments entering the lake through erosion from littoral areas of the lake, riverbanks, and watersheds. Where necessary, municipal water treatment plants would be upgraded to reduce nutrient contributions to the lake. Establishment of "no wake" zones was suggested in the Lake Management Plan for erosional stream banks.

The principal focus of the Lake Management in the Lower River is to reduce riverbank erosion. This would be accomplished through bank stabilization.

In the deep, open water zone, management practices to improve water and sediment quality would primarily be those employed in the other three zones. Deep waters in the lake would be a beneficiary of actions taken to reduce erosion and nutrient loading from within the basin.

8.2.3 Spokane River

Five alternatives have been developed for the Spokane River. Alternatives for the Spokane River address both human health and ecological protection and were developed based on specific input from State of Washington.

- 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 State and the Mining Companies did not develop cleanup plans for the 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.

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.

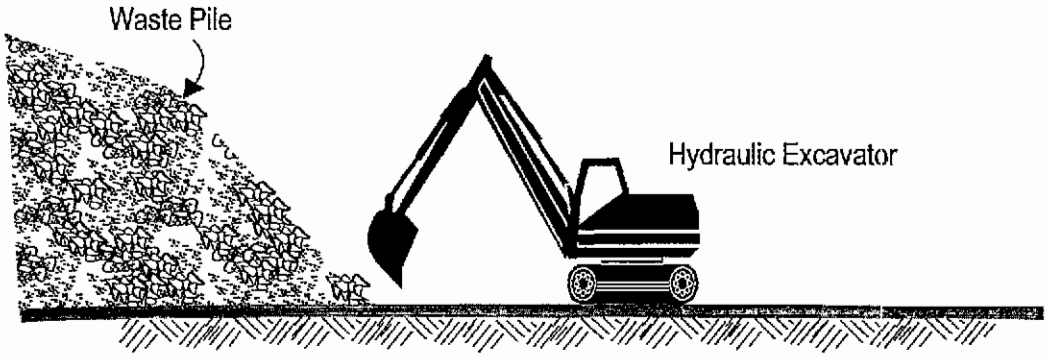
Alternative 4—More Extensive Removal, Disposal, and Containment

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 habitat areas that may pose significant ecological risks. The affected beach and bank materials would be excavated and disposed of off-site, permanently eliminating the human health and ecological exposure pathways of concern. All excavated areas would be backfilled with suitable material, to restore desired grades and elevations. In-stream sediments (behind Upriver Dam) exceeding PRGs would be capped to minimize direct ecological exposures.

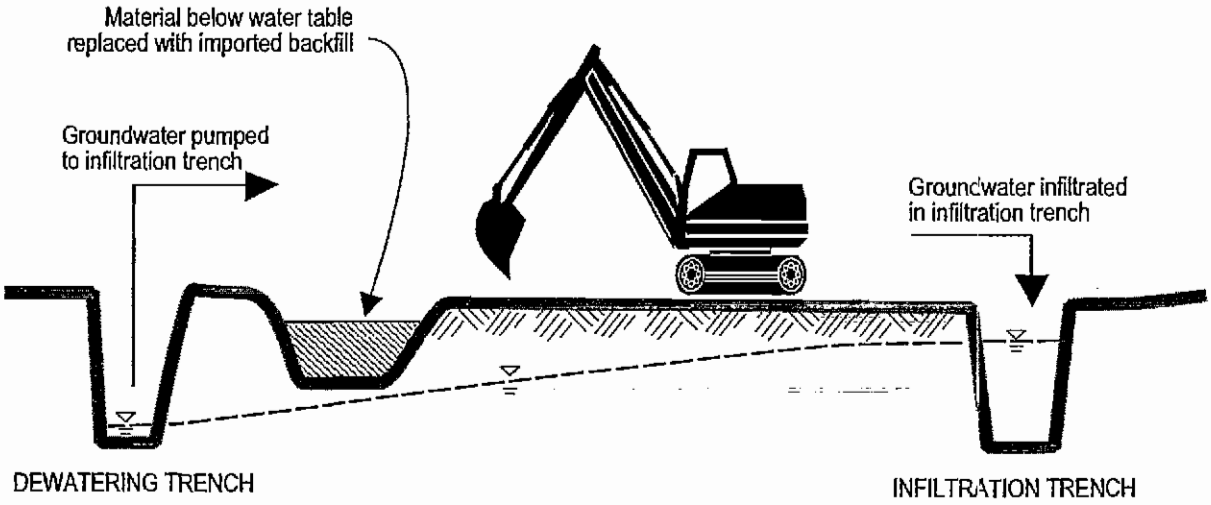
Alternative 5—Maximum Removal and Disposal

Alternative 5 includes more extensive beach and in-stream sediment cleanup actions to remove, where practicable, all materials posing significant human health or ecological risks. The affected beach and bank materials would be excavated and disposed of off-site, permanently eliminating the human health and ecological exposure pathways of concern. All excavated areas would be backfilled with suitable material, to restore desired grades and elevations. In-stream sediments behind Upriver Dam that exceed PRGs would be dredged and disposed of off-site, eliminating the ecological exposures of concern.

TCD C1. Excavation above water table



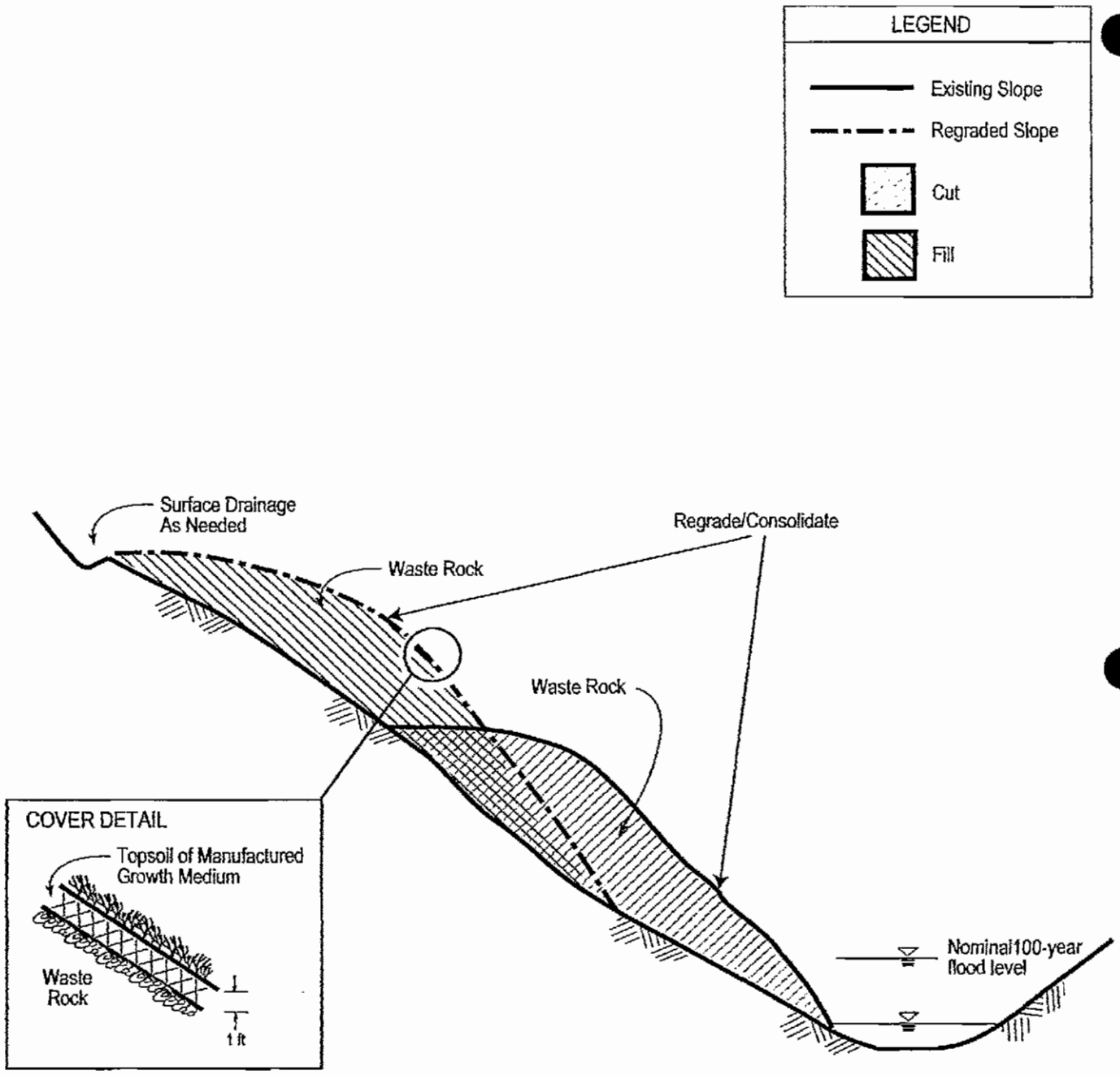
TCD C1a. Excavation below water table



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

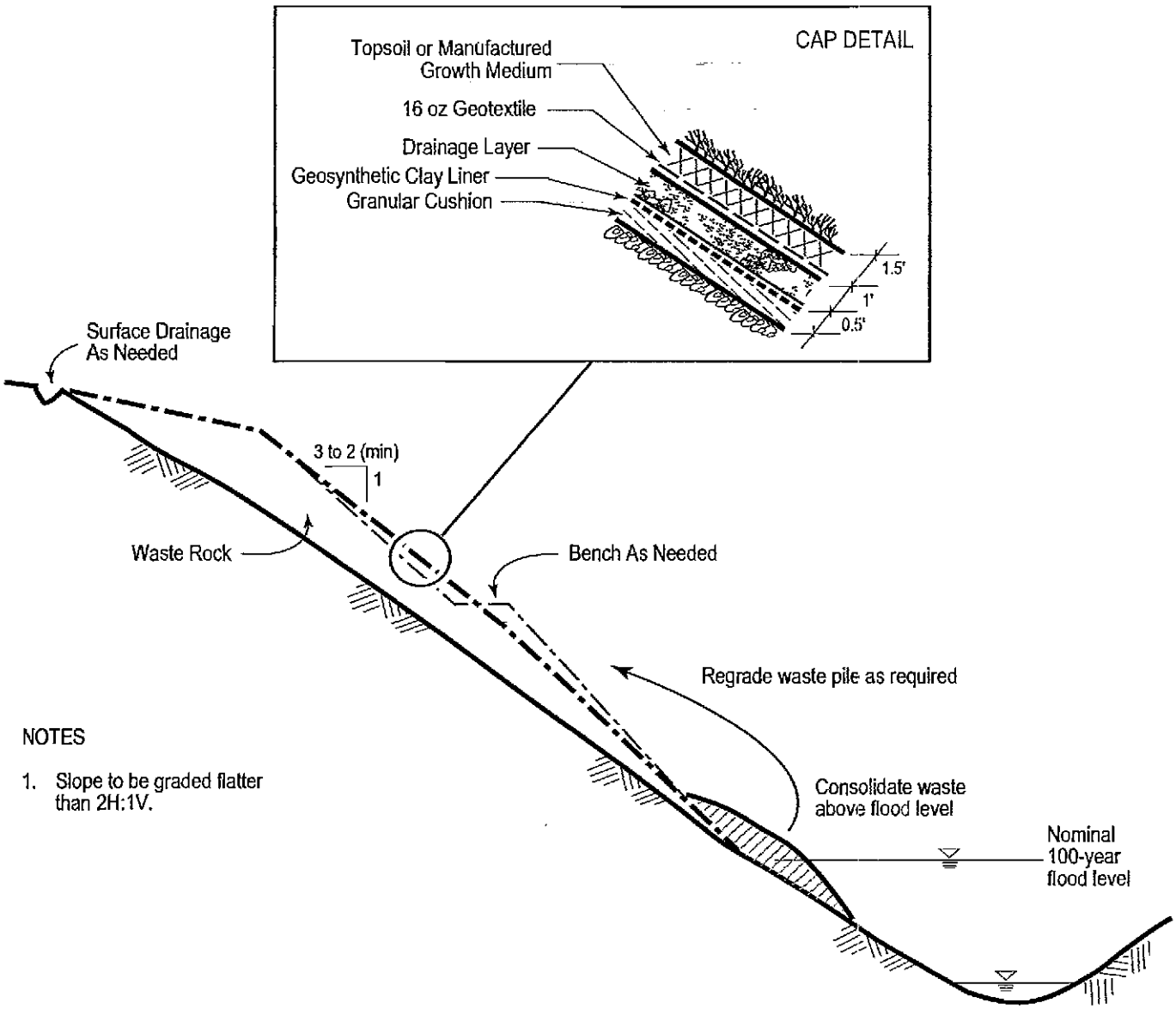
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-2001 091500	*Figure 8.2-1* **TCD C1: Excavation**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-102 111000	**Figure 8.2-2** **TCD C2: Regrade/Consolidate/Revegetate**



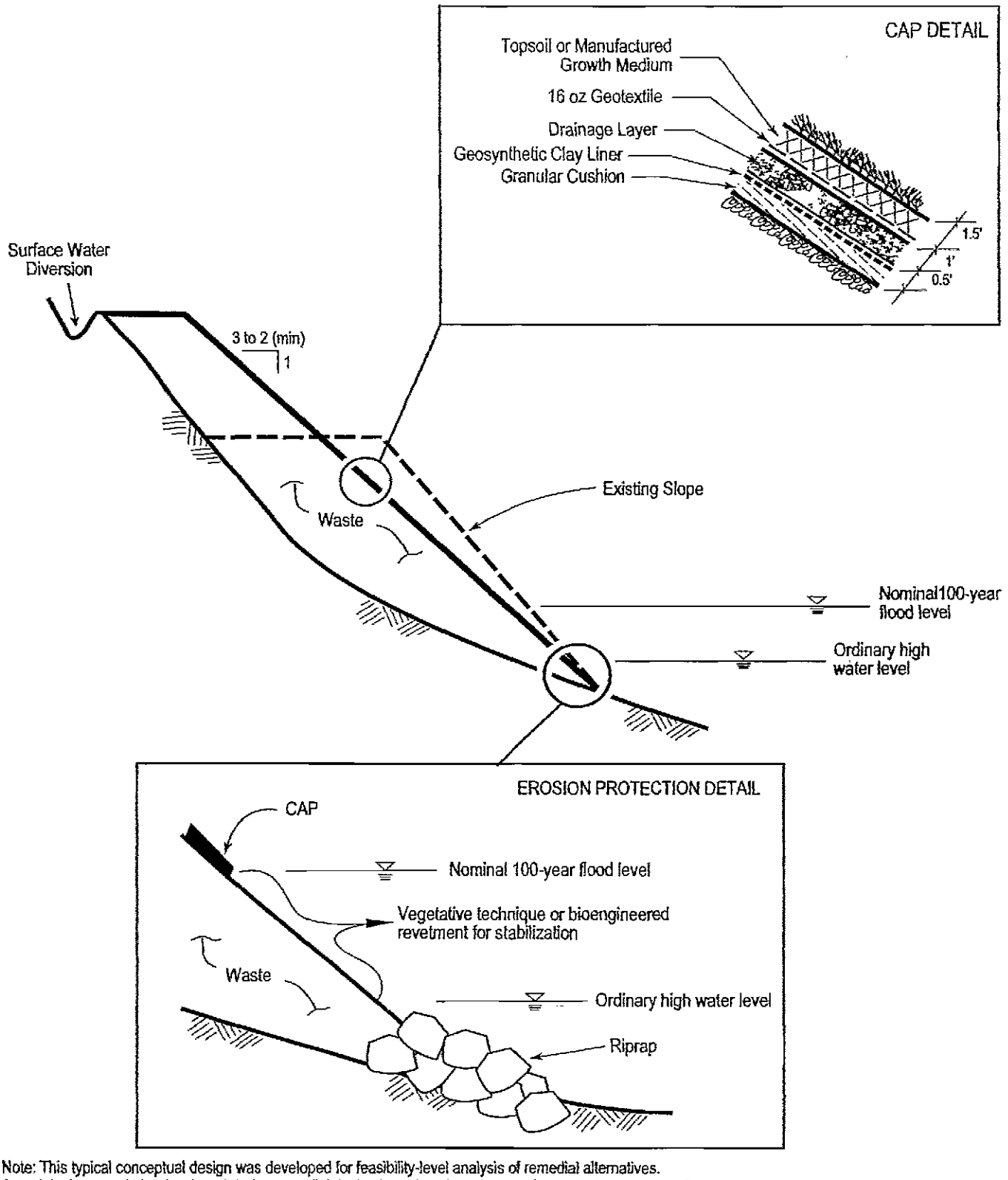
NOTES

1. Slope to be graded flatter than 2H:1V.

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

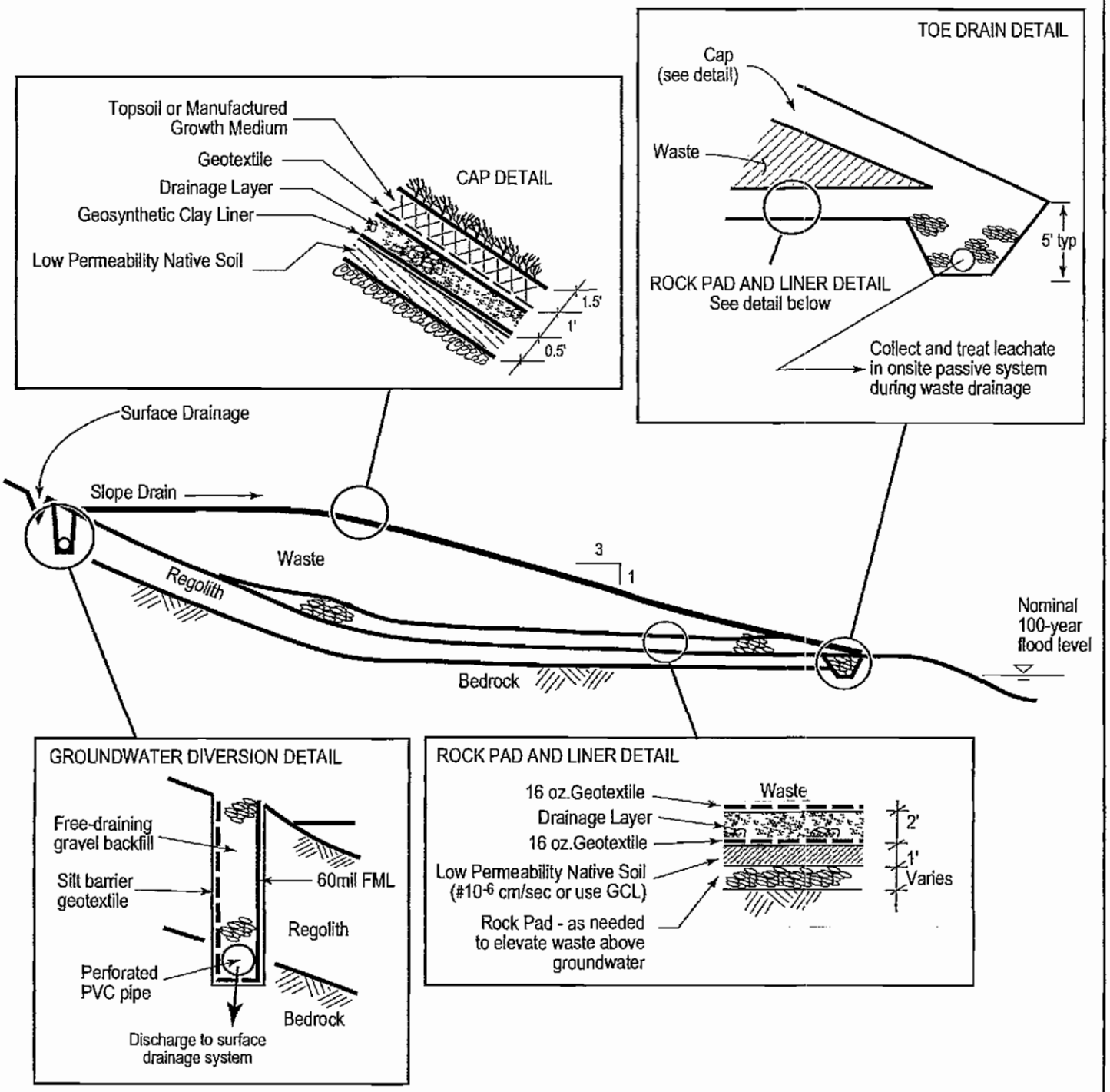
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-103 030700	**Figure 8.2-3** **TCD C3: Low Permeability Native Soil Cap**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

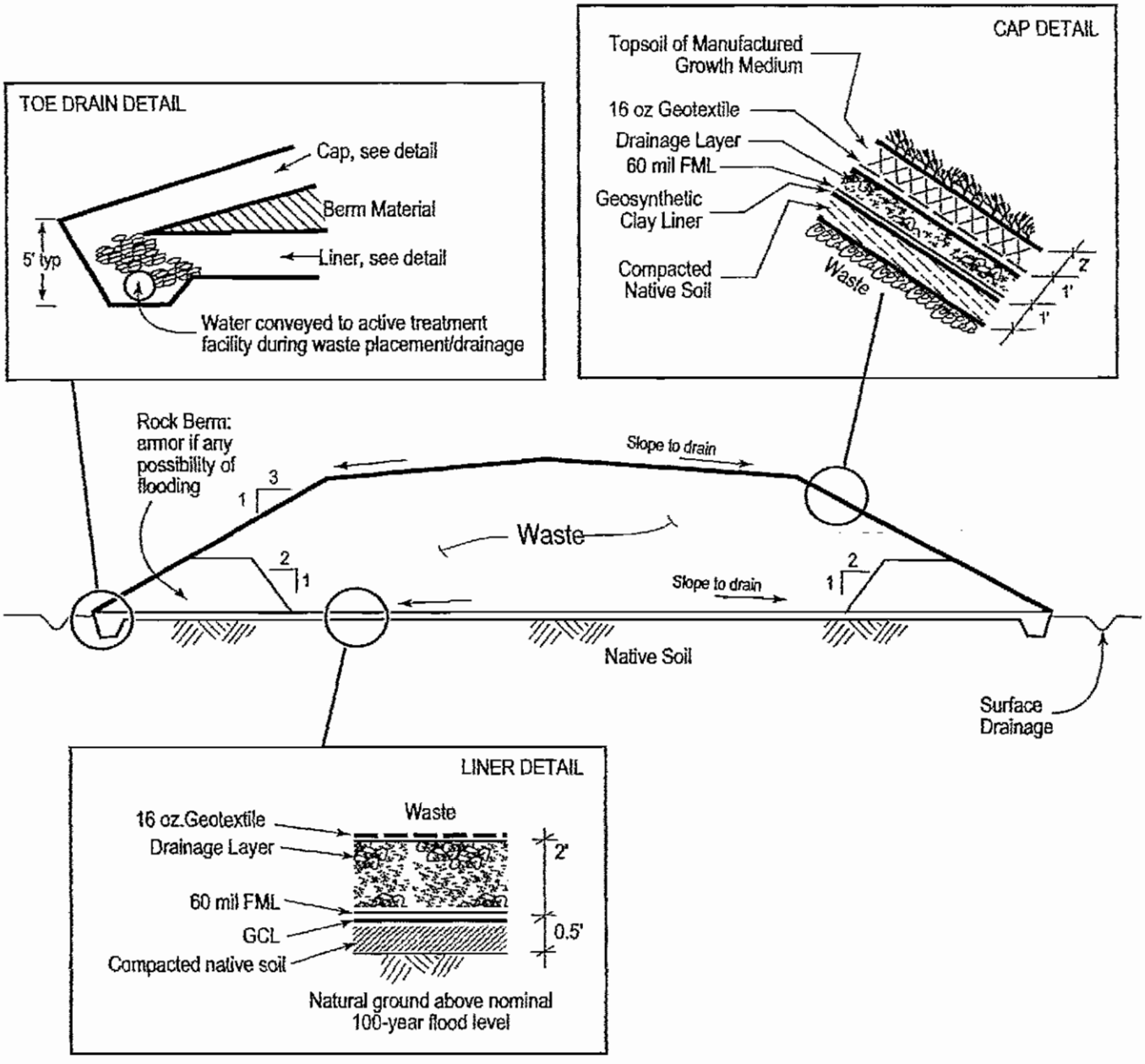
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-105 11100	**Figure 8.2-4** **TCD C5: Low Permeability Native Soil Cap with Erosion Protection**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

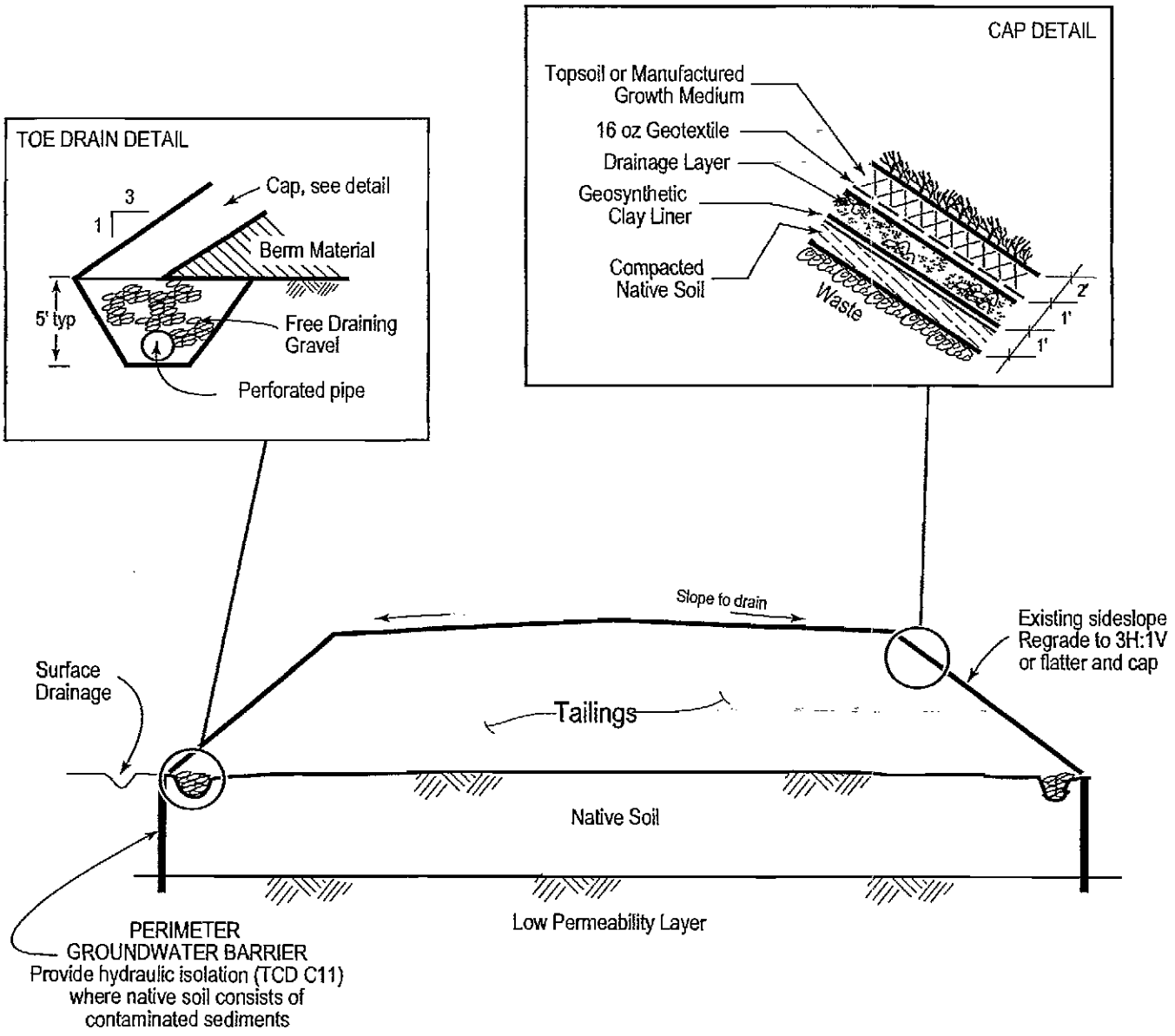
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-107 111100	**Figure 8.2-5** **TCD C7: Local Repository Above Flood Level**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

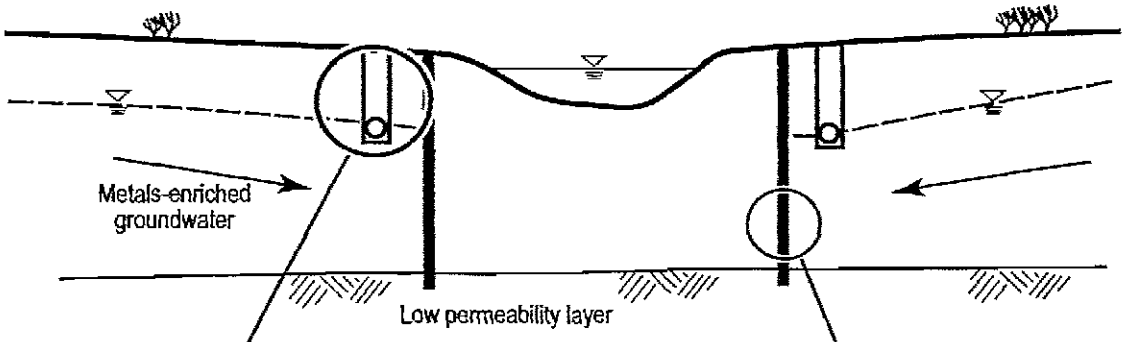
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control. 4162500.06664.05a Generation: 1 FS-101 111100	**Figure 8.2-6** **TCD C8: Regional Repository**

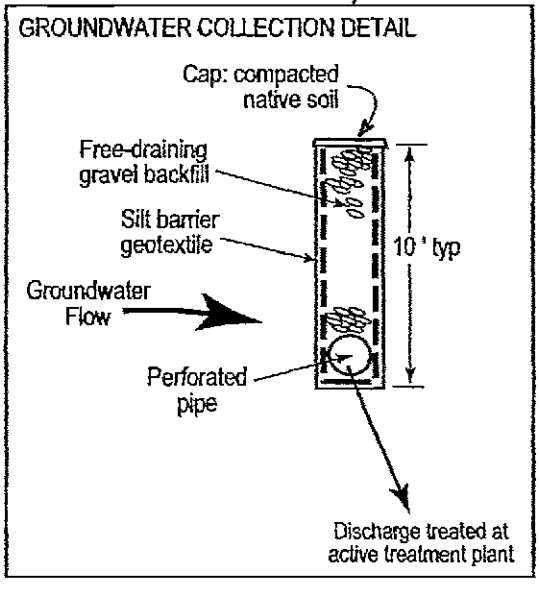


Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-108 111100	**Figure 8.2-7** **TCD C9: Tailings Impoundment Closure**





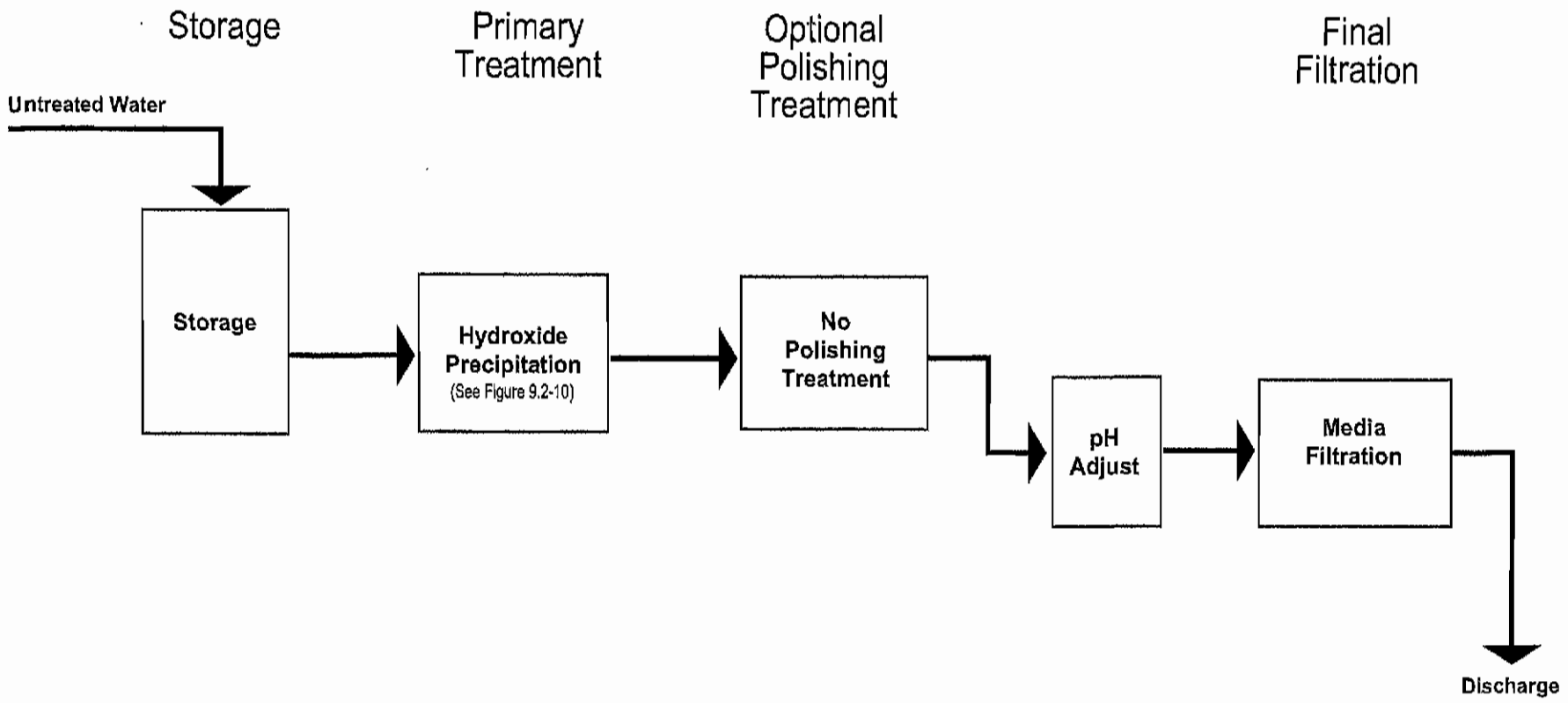
GROUNDWATER BARRIER
Slurry wall placed minimum 1 foot into low permeability layer

Note:
1. Unit cost based on slurry wall on one side of stream
2. Also used for isolation of discrete facilities (e.g. tailings impoundments) using wall around entire perimeter of facility

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-110 11100	**Figure 8.2-8** **TCD C11: Hydraulic Isolation Using Slurry Wall**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
REMEDY REVIEW BOARD

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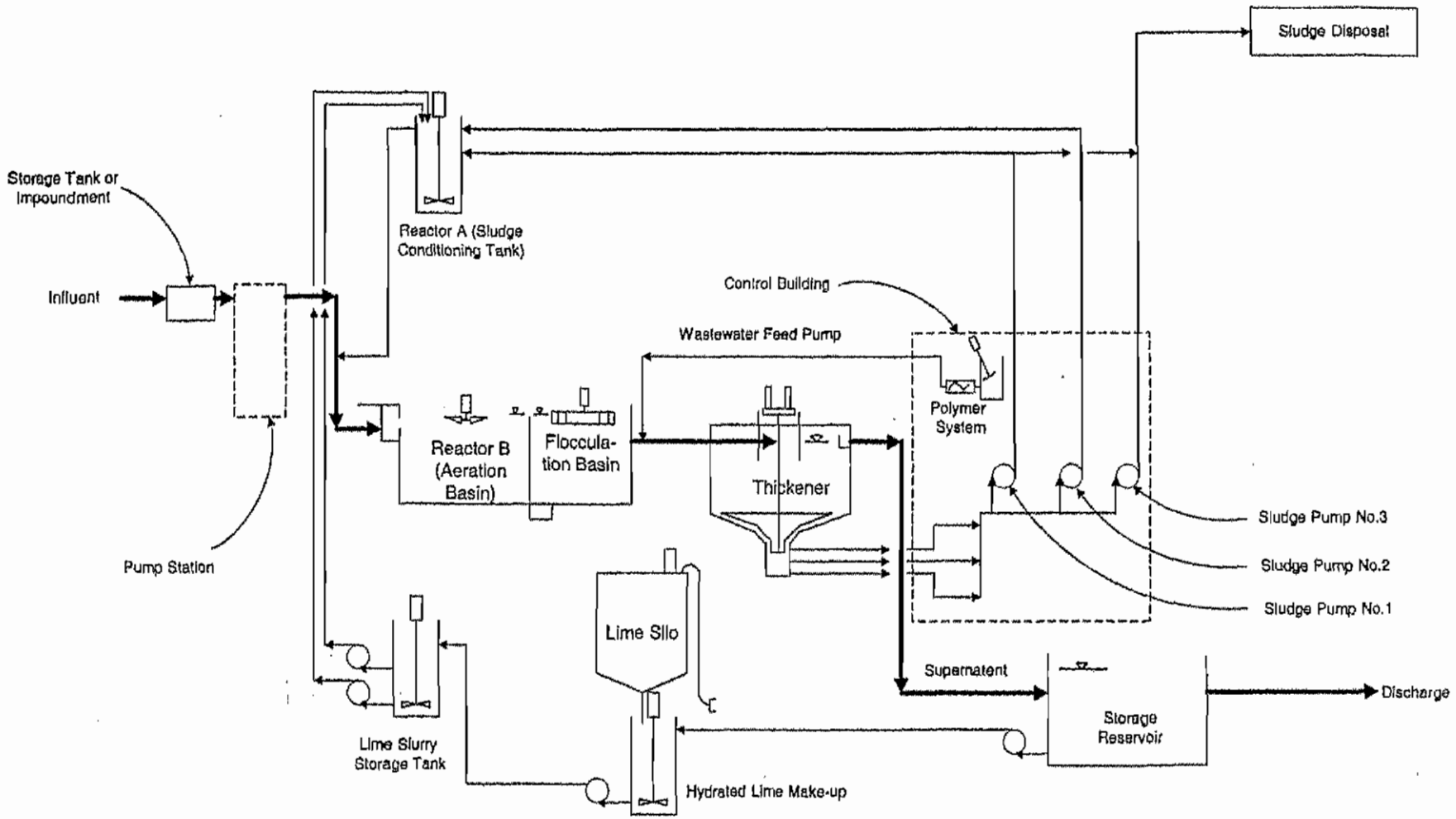
091500

Figure 8.2-9
Flow Diagram:TRMT-1



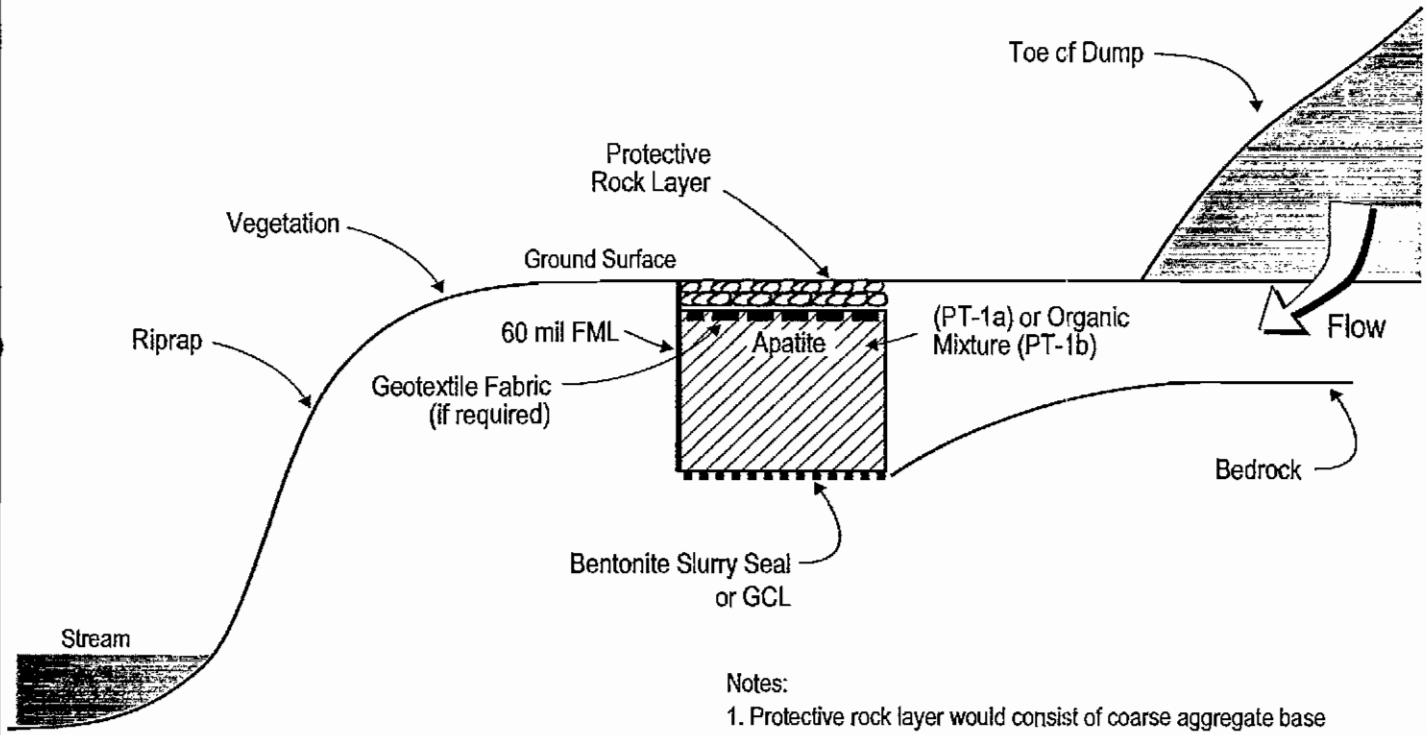
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
EDY REVIEW BOARD

Doc. Control:
Generation: 1

TM3-102
030800

Figure 8.2-10
HDS Hydroxide Precipitation

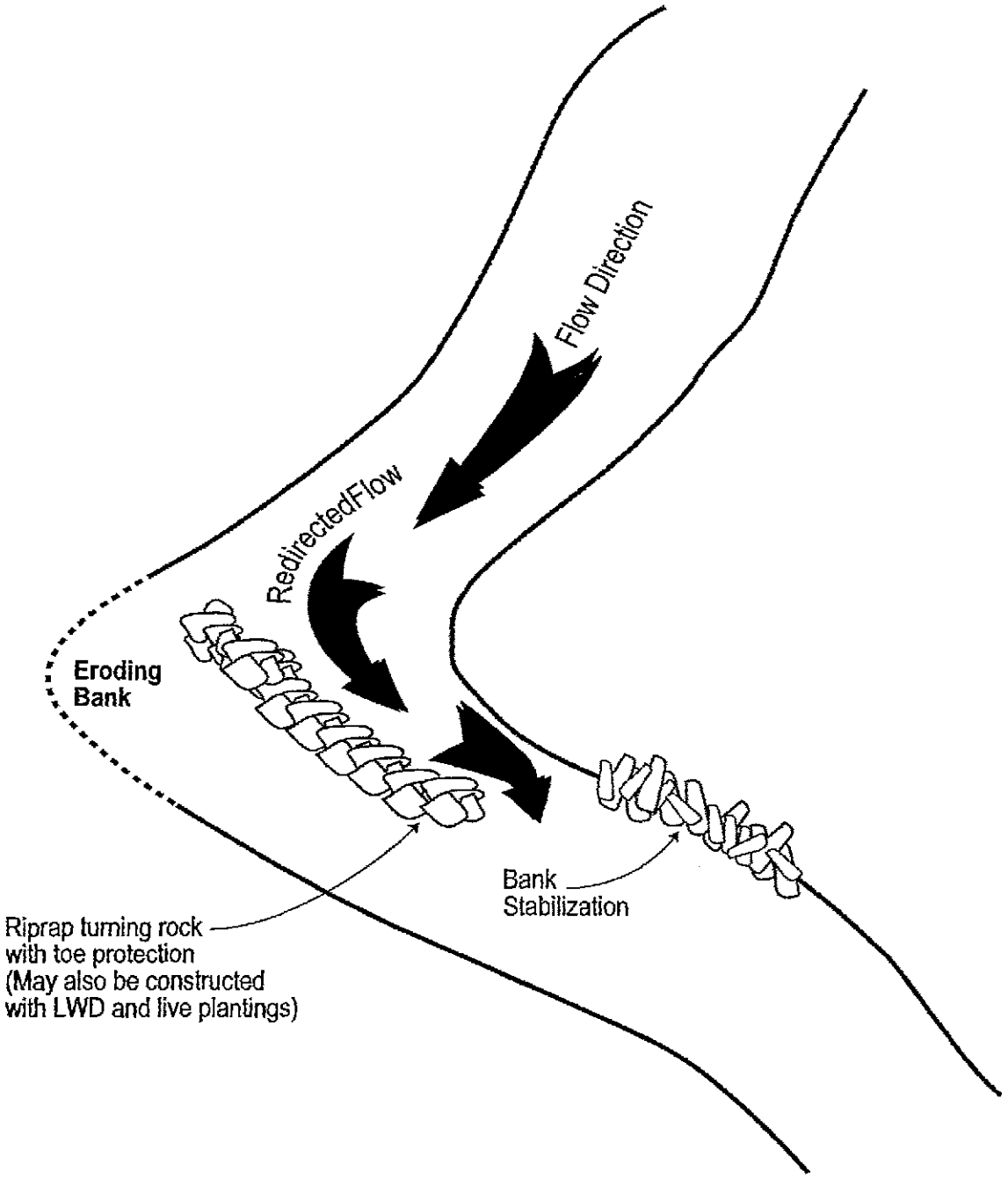


Notes:

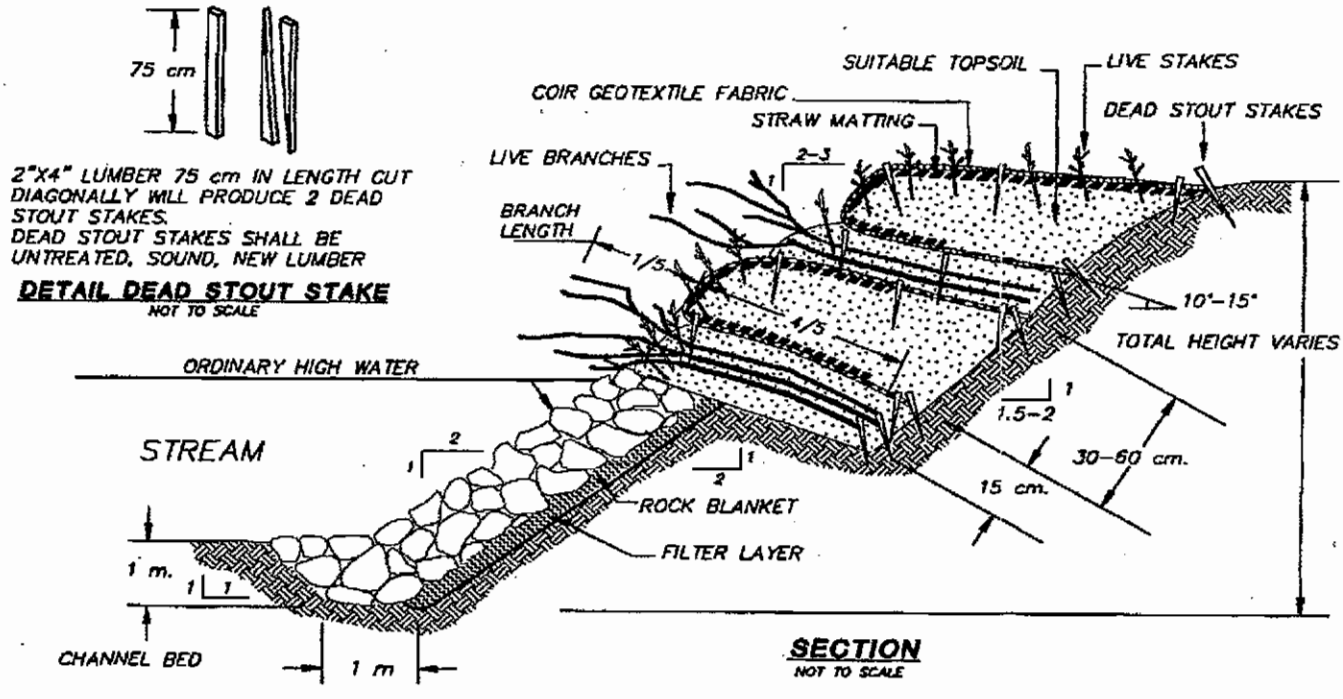
1. Protective rock layer would consist of coarse aggregate base (Type A5-2" Minus).
2. Baffles will typically extend from bottom to 1/2 to 2/3 height of apatite.
3. FML = Flexible membrane liner
4. GCL = Geosynthetic clay liner

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.05664.05a Generation: 1 FS-103 111100	**Figure 8.2-11** **Typical Treatment Trench Cross Section** **TCD PT-1**

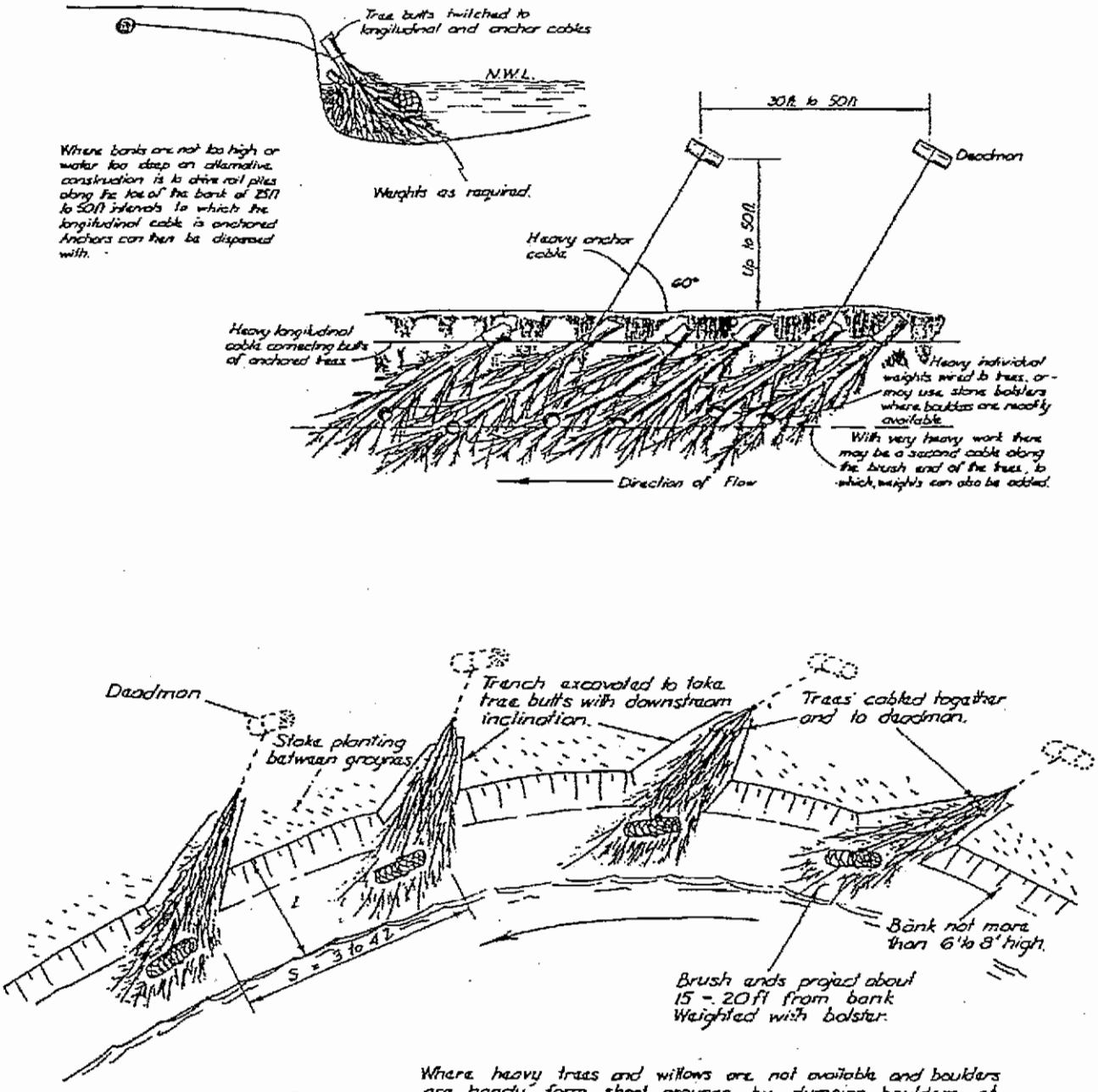


EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4152500.06654.05a Generation: 1 FS-56 092500	**Figure 8.2-12** **Riprap Turning Rock Wall to Protect Eroding Outer Bend** **TCD CD-6**



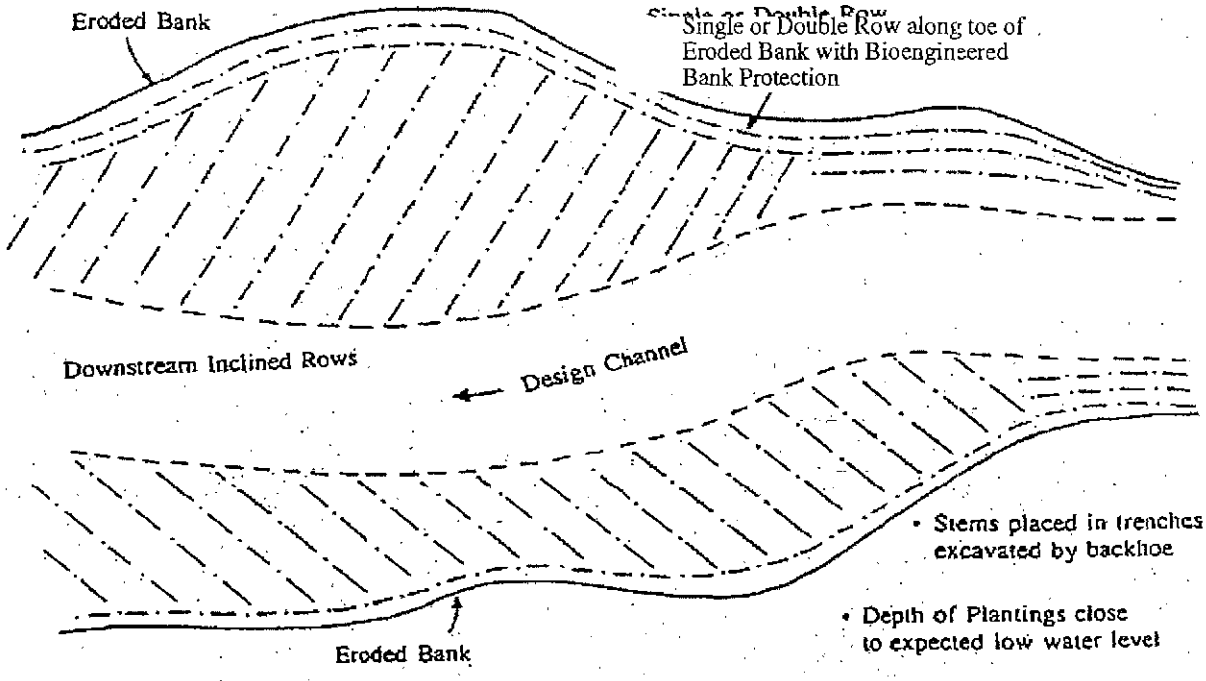
Source: Babakaiff et al.1997

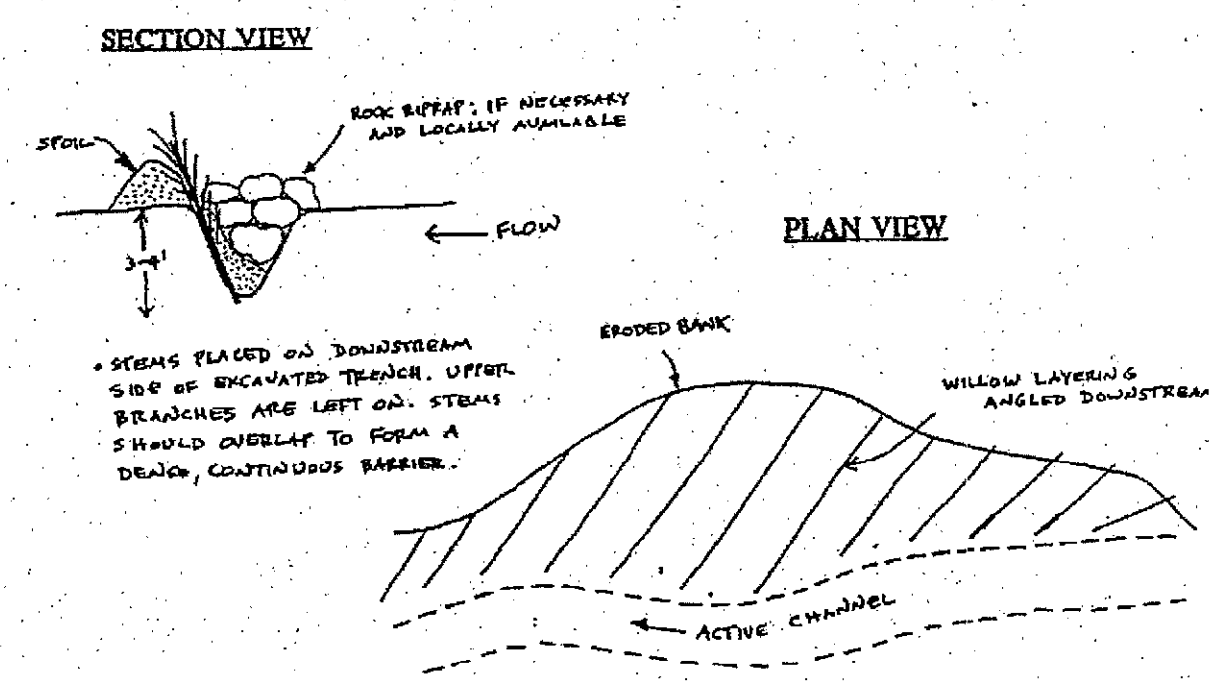
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-63 042600	**Figure 8.2-13** **Typical Vegetated Geogrid** **TCD BSBR-1**



Source: Matthews 1998

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.05664.05a Generation: 1 FS-68 092500	Figure 8.2-14 Sketch of Tree Deflectors (from Acheson 1968) TCD BSBR-5





Source: Matthews 1996

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-69 092500	**Figure 8.2-15** **Floodplain Plantings** **TCD FP/RP-1**

Table 8.2-1
General Response Actions for the Ecological FS

Media In Process Options Database*	General Response Actions
Mine Water, Seeps, Springs, and Leachate	No Action Institutional Controls Water Collection Water Treatment Mine Closure
Groundwater	No Action Institutional Controls Containment Water Collection Water Treatment Mine Closure
Surface Water	No Action Institutional Controls Containment Water Collection Water Treatment
Upland Waste Rock/Tailings/Soils/Mine Waste	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Submerged Waste Rock/Tailings/Sediments (South Fork Coeur d'Alene River Above Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment

Table 8.2-1 (Continued)
General Response Actions for the Ecological FS

Media In Process Options Database[a]	General Response Actions
Hazardous Wastes	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Water Collection Re-establish Impacted Habitat In Situ Soil Treatment
Floodplain Sediments (Below Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Submerged Sediments (Below Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Submerged Sediments (Lateral Lakes)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment

[a] For the FS analysis, submerged sediments, waste rock, and tailings were evaluated together with floodplain sediments, waste rock, and tailings, respectively, as three media: floodplain sediments, floodplain waste rock, and floodplain tailings.

Table 8.2-2
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Mine Water, Seeps, Springs, and Leachate	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
			Barriers/Barricades
		003 Monitoring	Surface Water Sampling
			Surface Water Gaging and Analysis
	Water Collection	250 Water Collection	Diversion Structures
			Trenches/French Drains/Pipe Drains
		251 Water Transport	Water Pipelines
	Water Treatment	102 Dewatering	Belt Presses (Expression)
		153 Chemical Treatment	Sulfide Precipitation
			Alkaline Precipitation
			Oxidation(includes Aeration for Metals Precipitation)
		154 Physical Treatment	Adsorption using Natural or Synthetic Media
			Microfiltration
			Gravity Filtration
			Coagulation/Flocculation
			Gravity Sedimentation/Clarification
			Flow Equalization
			Permeable Treatment Beds
		155 Biological Treatment	Aerobic Wetland/Surface Flow
			Anaerobic Wetland/Subsurface Flow
			Biotrench
		300 Discharge	Stream/River Discharge
Groundwater	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Groundwater Sampling (well monitoring)
	Containment	054 Vertical Barriers	Vertical Concrete Wall/Slurry Wall
	Water Collection	250 Water Collection	Trenches/French Drains/Pipe Drains
		251 Water Transport	Ditches/Flumes
			Water Pipelines
	Water Treatment	102 Dewatering	Belt Presses (Expression)
		153 Chemical Treatment	Sulfide Precipitation

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Groundwater	Water Treatment	153 Chemical Treatment	Alkaline Precipitation
			Oxidation(includes Aeration for Metals Precipitation)
		154 Physical Treatment	Adsorption using Natural or Synthetic Media
			Microfiltration
			Gravity Filtration
			Coagulation/Flocculation
			Gravity Sedimentation/Clarification
			Flow Equalization
			Permeable Treatment Beds
		155 Biological Treatment	Aerobic Wetland/Surface Flow
			Anaerobic Wetland/Subsurface Flow
			Biotrench
		300 Discharge	Stream/River Discharge
Surface Water	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Surface Water Sampling
			Surface Water Gaging and Analysis
	Water Collection	250 Water Collection	Diversion Structures
		251 Water Transport	Ditches/Flumes
	Water Treatment	300 Discharge	Stream/River Discharge
Upland Waste Rock/Tailings/Soils/Mine Waste	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
		003 Monitoring	Vegetative Cover Sampling
		007 Flood Plain/Land Management	Vegetation Clearing Restrictions
	Containment	051 Consolidation	Backhoes/Loaders
			Scrapers
			Trucks/Trailers
			Bulldozers/Graders
		052 Terrestrial Capping (Capping in the Dry)	Soil
			Flexible Membrane Liners
			Geosynthetic Clay Liners (GCL)

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Upland Waste Rock/Tailings/Soils/Mine Waste	Containment	052 Terrestrial Capping (Capping in the Dry)	Gravel
			Geotextile
		056 Surface Controls/Erosion Controls	Grading
			Diversion/Collection Systems
			Engineered Armoring-Soft
			Vegetative Armoring
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
			Sediment Traps/Ponds
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Scrapers
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Conventional Backfill
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	451 Re-establish Vegetation	Soil Placement/Replacement
			Soil Amendments/Augmentation
			Seeding
			Transplanting
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition
		155 Biological Treatment	Biosolids Application
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
		003 Monitoring	Soil/Sediment Contaminant Sampling
			Vegetative Cover Sampling

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	Institutional Controls	007 Flood Plain/Land Management	Vegetation Clearing Restrictions
			Land Use Agreements
	Containment	051 Consolidation	Backhoes/Loaders
			Scrapers
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
			Bulldozers/Graders
		052 Terrestrial Capping (Capping in the Dry)	Soil
			Flexible Membrane Liners
			Geosynthetic Clay Liners (GCL)
			Gravel
			Geotextile
		054 Vertical Barriers	Vertical Concrete Wall/Slurry Wall
		056 Surface Controls/Erosion Controls	Grading
			Diversion/Collection Systems
			Engineered Armoring-Soft
			Vegetative Armoring
			Stream Deflection/Realignment
			Buffer Strips
			Contour Wattling
			Brush Mattresses or Mats
			Live Stakes
			Tree Revetments
		057 Sediment Transport Controls	Levees/Training Structures
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
			Sediment Traps/Ponds
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	Soil Removal	101 Excavation	Scrapers
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Conventional Backfill
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	450 Re-establish Wildlife Habitat	Plant Appropriate Forage/Feed Species
			Re-establish Refugia
			Establish Greenbelts/Urban Wildlife Habitat/Habitat Buffers
		451 Re-establish Vegetation	Soil Placement/Replacement
			Soil Amendments/Augmentation
			Re-establish Wetlands
			Seeding
			Transplanting
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition
		155 Biological Treatment	Biosolids Application
Submerged Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Soil/Sediment Contaminant Sampling
	Containment	051 Consolidation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
		056 Surface Controls/Erosion Controls	Engineered Armoring-Soft
			Vegetative Armoring
			Stream Deflection/Realignment
			Combined Armoring
			Brush Mattresses or Mats
			Live Stakes

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Submerged Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	Containment	056 Surface Controls/Erosion Controls	Bank Crib and Cover Log
			Tree Revetments
		057 Sediment Transport Controls	Instream Controlled Sediment Deposition
			Sediment/Current Deflectors
		070 Temporary Sediment Control Measures	Best Management Practices for Underwater Sediments
			Silt Curtain Barriers
			Silt Screen Barrier
		053 Subaqueous Capping (Capping Underwater)	Geosynthetic Clay Liners (GCL)
			Gravel
			Clean Sediments
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Conventional Backfill
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	452 Re-establish Aquatic Habitat	Re-establish Refugia
			Provide Shade, Hiding Cover, and Allochthonous Energy
			Large Woody Debris Placement
			Boulder Pools
			Off Channel Pools
			Nurse Logs
			Tree Revetments
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Hazardous Wastes	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
	Containment	051 Consolidation	Backhoes/Loaders
			Trucks/Trailers
			Bulldozers/Graders
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Scrapers
		103 Transport	Trucks/Trailers
		091 Decontamination	Washing
	Soil Disposal	201 Offsite Disposal	RCRA-Subtitle C Facility
Floodplain Sediments (Below Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
		003 Monitoring	Soil/Sediment Contaminant Sampling
			Vegetative Cover Sampling
		007 Flood Plain/Land Management	Grazing Controls
			Vegetation Clearing Restrictions
			Wetlands Maintenance
			Land Use Agreements
	Containment	008 Water Level Control	Setback Levees/Compound Channel
		051 Consolidation	Backhoes/Loaders
			Scrapers
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
			Bulldozers/Graders
		052 Terrestrial Capping (Capping in the Dry)	Soil
			Flexible Membrane Liners
			Geosynthetic Clay Liners (GCL)
			Gravel
			Geotextile
		054 Vertical Barriers	Berms/Dikes

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Sediments (Below Cataldo)	Containment	054 Vertical Barriers	Vertical Concrete Wall/Slurry Wall
		056 Surface Controls/Erosion Controls	Diversion/Collection Systems
			Vegetative Armoring
			Buffer Strips
			Brush Mattresses or Mats
			Live Stakes
			Setback Levees/Compound Channel
			Tree Revetments
		057 Sediment Transport Controls	Levees/Training Structures
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Scrapers
			Drag Lines/Clam Shells/Mechanical Dredges
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Lake Disposal (Isolated Portion of Coeur d'Alene Lake)
			Lateral Lake Disposal
			Conventional Backfill
			Confined Disposal Facility
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	450 Re-establish Wildlife Habitat	Plant Appropriate Forage/Feed Species
			Re-establish Refugia
			Establish Greenbelts/Urban Wildlife Habitat/Habitat Buffers
		451 Re-establish Vegetation	Soil Placement/Replacement
			Soil Amendments/Augmentation
			Re-establish Wetlands

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Sediments (Below Cataldo)	Re-establish Impacted Habitat	451 Re-establish Vegetation	Seeding
			Transplanting
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition
		154 Physical Treatment	Deep Tilling
		155 Biological Treatment	Biosolids Application
Submerged River Sediments (Below Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Soil/Sediment Contaminant Sampling
	Containment	056 Surface Controls/Erosion Controls	Vegetative Armoring
			Stream Deflection/Realignment
			Combined Armoring
			Live Stakes
			Tree Revetments
		057 Sediment Transport Controls	Off-line Contaminated Sediment Storage
			Instream Controlled Sediment Deposition
			Sediment/Current Deflectors
		070 Temporary Sediment Control Measures	Best Management Practices for Underwater Sediments
			Silt Curtain Barriers
			Silt Screen Barrier
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
		101 Excavation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Mechanical/Hydraulic Dredges
			Hydraulic Dredges
		102 Dewatering	Gravity Thickening
		103 Transport	Trucks/Trailers
			Barges/Boats
			Slurry Pipelines
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Submerged River Sediments (Below Cataldo)	Soil Disposal	200 Onsite Disposal	Lake Disposal (Isolated Portion of Coeur d'Alene Lake)
			Lateral Lake Disposal
			Conventional Backfill
			Confined Disposal Facility
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	452 Re-establish Aquatic Habitat	Provide Shade, Hiding Cover, and Allochthonous Energy
Submerged Sediments (Lateral Lakes)	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Soil/Sediment Contaminant Sampling
		007 Flood Plain/Land Management	Vegetation Clearing Restrictions
			Wetlands Maintenance
			Land Use Agreements
	Containment	008 Water Level Control	Modify/Construct Water Level Control Structures-Metals Control
			Modify/Construct Water Level Control Structures-Habitat
		051 Consolidation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
		054 Vertical Barriers	Berms/Dikes
		056 Surface Controls/Erosion Controls	Engineered Armoring-Soft
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
			Best Management Practices for Underwater Sediments
			Silt Curtain Barriers
			Silt Screen Barrier
		053 Subaqueous Capping (Capping Underwater)	Soil
			Organic Cover
			Gravel
			Clean Sediments
			Sand

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Submerged Sediments (Lateral Lakes)	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
		101 Excavation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Mechanical/Hydraulic Dredges
			Hydraulic Dredges
		102 Dewatering	Gravity Thickening
		103 Transport	Trucks/Trailers
			Barges/Boats
			Slurry Pipelines
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Lake Disposal (Isolated Portion of Coeur d'Alene Lake)
			Lateral Lake Disposal
			Conventional Backfill
			Confined Disposal Facility
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	451 Re-establish Vegetation	Re-establish Wetlands
		452 Re-establish Aquatic Habitat	Re-establish Refugia
			Provide Shade, Hiding Cover, and Allochthonous Energy
			Large Woody Debris Placement
			Nurse Logs
	In-Situ Soil Treatment	155 Biological Treatment	Biosolids Application

Notes: CU = cubic yard
IDEQ = Idaho Department of Environmental Quality

Table 8.2-3
Description of TCDs

TCD	Purpose	Application Criteria
Excavation	Removal of materials from areas where they are subject to erosion or leaching.	Tailings, waste rock mixtures, contaminated floodplain sediments, and waste rock piles that are potentially erodable or significant sources of metals loading.
Regrade/Consolidate/ Vegetative Cover	Isolate waste from human or ecological contact Decrease potential for erosion of waste Doesn't significantly decrease infiltration	Erodable or otherwise unstable waste rock piles without significant leaching potential under Alts 2 and 3. Waste rock with minimal leaching potential under Alt 4. Use C2a where only toe of waste pile is in nominal 100-yr floodplain; C2b where waste pile has largely filled in valley bottom; distinction made for cost estimating purposes. Use C2c where steep slopes prevent placement of vegetative cover (steeper than 1.5H:1V).
Low Permeability Cap	Significantly reduce infiltration	Contaminated sediments, tailings, waste rock and waste rock/tailings mixtures that are potentially significant sources of metals loading under Alt 2. Waste rock and waste rock/tailings mixtures that are not potential significant sources of metals loading under Alts 3 and 4.
Low Permeability Cap with Erosion Protection	Significantly reduce infiltration + minimize erosion of waste below the nominal 100-year flood level at sites where relocation above the flood level could not be implemented due to steep ground slopes.	Waste rock or waste rock/tailings mixtures that are not significant sources of metal loading under Alt 2. Waste rock piles subject to erosion that are remotely located or relatively small sources of metals loading under Alt 3. Would not be used under Alt 4.
Local Repository Above Flood Level	Provide a relatively high degree of protectiveness for wastes that are potentially significant sources of metals loading.	Used for contaminated sediments, tailings, and tailings/waste rock mixtures under Alt 2. Used for tailings and tailings/waste rock mixtures under Alt 3. Used for waste rock with erosion or leaching potential under Alt 4.
Regional Repository	Provide the highest level of protection among the containment TCDs.	Used for tailings and contaminated sediments under Alt 3. More general use under Alt 4, including all tailings, all tailings/waste rock mixtures that are potentially significant sources of metals loading, all floodplain sediments containing levels of metals above PRGs, and all tailings currently contained in abandoned tailings impoundments. May also be used for some lower-level wastes where it is the most cost effective TCD.
Tailings Impoundment Closure	To address the closure of abandoned tailings impoundments or cells under Alternatives 2 and 3.	All abandoned tailings impoundments and cells under Alts 2 and 3.

Table 8.2-3 (Continued)
Description of TCDs

TCD	Purpose	Application Criteria
Hydraulic Isolation Using Slurry Wall	To minimize the discharge of contaminated groundwater to the surface water system, thereby reducing the dissolved metals loading to the surface water system.	Areas where metals impacts to groundwater are not controlled by removal and containment of source materials under Alts 3 and 4.
Hydroxide Precipitation with Media Filtration	To remove heavy metals from an aqueous stream using active treatment.	Active treatment used to provide relatively high metals removal rates and treatment reliability for water containing high metals loads. It would also be used for treating flow rates in excess of those that could practically be treated using passive treatment. Active treatment used under Alts 3 and 4 for adits identified as major loaders, leachate from regional repositories, and contaminated groundwater.
Permeable Reactive Barrier	To remove metals through adsorption/precipitation reactions using apatite or another chemical reagent within a permeable reactive barrier or treatment bed. Typically for oxidizing or low iron conditions.	Generally applicable for lower flow volumes such as drainage from adits, seeps, leachate from repositories, and runoff from waste piles. Used under Alt 2 for adits identified as major loaders. Used under Alts 3 and 4 for adits not identified as major loaders, but discharging metals at levels of concern. Potentially used for leachate from repositories and contaminated groundwater under Alternatives 3 and 4.
Current Deflector	Directs stream energy away from erodable areas, or uses series of deflectors to dissipate stream energy. Creates scour holes, pools and other habitat features. May be oriented to serve as sediment traps.	Apply throughout CSM Units 1 and 2 where stream bank and bedload stabilization, and dissipation of stream energy is desirable.
Bank Stabilization Using Bioengineered Revetments	Protects eroding streambanks or rehabilitates banks after excavation.	Applicable in low to high energy stream environments in CSM Units 1 and 2
Vegetative Bank Stabilization	Stabilizes eroding streambanks or reconstructs them after excavation and removal of bank material. Rock toe prevents undermining.	Applicable in low energy stream environments in CSM Units 2 and 3. May be used in CSM Unit 1 in conjunction with current deflectors.

Table 8.2-4
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Upper Basin					
Floodplain Sediment	Removals of tailings-impacted deposits in the current 100-year floodplain (excluding in-stream deposits) with disposal in local repositories; bank and stream stabilization using bioengineering methods	Same as Alternative 2 plus removal of accessible tailings-impacted deposits on the channel-side of I-90, with disposal in regional repositories;[a] selected areas of hydraulic isolation with treatment of groundwater in a regional water treatment plant[b]	Same as Alternative 3 but with maximum removal of tailings-impacted deposits and maximum use of hydraulic isolation with treatment of groundwater at a regional water treatment plant[c]	Selected removals from the 100-year floodplain, with capping; bioengineering and vegetative stabilization of selected stream banks and floodplains; selected use of riprap.	Limited removals; bank and stream stabilization using bioengineering methods
Tailings Piles/ Impoundments	Regrading and capping in place, as practical; otherwise, removal with disposal in on site or local repositories. Hydraulic isolation used for the Hecla-Star tailings impoundments in Canyon Creek	Similar to Alternative 2 but greater use of removals with disposal in on-site, local, or regional repositories; and greater use of hydraulic isolation	Maximum excavation and use of regional repositories	Removal from the 100-year floodplain with disposal in local or regional repositories; in-place closure of existing impoundments	Soil cover in place; limited removal (Hecla-Star complex at Burke) with disposal in an offsite repository
Upper Basin					
Waste Rock Piles	Within the 100-year floodplain, in-place regrading and capping, as practical, or removal; no action otherwise	Similar to Alternative 2 but with more removal and less regrading	Removal from the 100-yr floodplain with disposal in regional repositories; regrading and vegetative cover otherwise	Regrading or relocation out of the 100-year floodplain, with selected capping	Removal from the 100-yr floodplain; no action otherwise

Table 8.2-4 (Continued)
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Upper Basin (Continued)					
Adits	Major load sources—Treatment using passive, on-site technologies Minor load sources—No action	Major Load Sources—Collection and conveyance to a regional water treatment plant Minor Load Sources—Treatment using passive, on-site technologies	Major load sources—Same as Alternative 3, but applied to more adits Minor load sources—Same as Alternative 3, but applied to more adits	Major load sources (14 total)—Treatment using passive, on-site technologies Minor load sources—No action	Major load sources—Infiltration and water level control followed by wetland treatment if necessary Minor load sources—No action
Lower Basin					
River Banks and Levees	Partial removal of contaminated "bank wedges" with disposal in a regional repository at Cataldo/Mission Flats	Complete removal of contaminated "bank wedges;" disposal in a regional repository at Cataldo/Mission Flats or consolidation using CAD (confined aquatic disposal) in one or more of the lateral lakes	Same as Alternative 3	Partial removal and stabilization by grading and bioengineering. Implementation of a river management plan to prevent unacceptable erosion of the banks.	Revegetation, bioengineering, and limited removals based on susceptibility of banks to erosion.
River Bed	No action	Complete removal of affected sediments; same disposal options as for river banks and levees	Same as Alternative 3	Partial removal and disposal of contaminated sediments to eliminate hot spots and create hydraulic capacity as needed.	No action

Table 8.2-4 (Continued)
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Lower Basin (Continued)					
Wetlands	Strobl Marsh and Thompson Marsh—Limited removals, capping and protective dikes to control potential re-contamination from flood events	Strobl Marsh, Campbell Marsh, Orling Slough, Hidden Marsh, Moffit Slough, Thompson Marsh, Lane Marsh, and wetland areas of Thompson, Killarney, Swan, and Medicine Lakes—Sediment removal; same disposal options as for river removals; revegetation with native plants and soil amendments	Maximum sediment removal; revegetation with native plants and soil amendments; disposal same as for Alternative 3	Spot removals, capping and/or chemical treatments and re-vegetation in areas with high lead concentrations and high use by water fowl, including within or surrounding Orling Slough, Strobl Marsh, Lane Marsh (including seven splay areas), Hidden Marsh, Campbell Marsh, Thompson Marsh, Moffit Slough; Medicine Lake, Swan Lake, and Thompson Lake.	Habitat shifting techniques, and consideration of selective in situ chemical stabilization and/or capping with biosolid material of some of the most lead-enriched sediments
Lateral Lakes	Thompson Lake—Dredging from the shore to a water depth of approximately 6 feet with disposal in a repository adjacent to the lake	Thompson, Killarney, Swan, and Medicine Lakes—Dredging from the shore to water depths of about six feet; same disposal options as for river removals	Maximum dredging; disposal same as for Alternative 3	Included with wetlands	Similar to wetlands

Table 8.2-4 (Continued)
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Lower Basin (Continued)					
Other Floodplain Areas	Soil amendments to promote vegetation for erosion control and chemical stabilization to reduce metal availability to ecological receptors and transport to surface water	Sediment removal; disposal in a local repository at Cataldo/Mission Flats; revegetation with native plants and soil amendments	Same as wetlands	Soil treatment and re-vegetation for highly contaminated areas	Similar to wetlands
Cataldo/Mission Flats	Hydraulic isolation (using a groundwater cutoff wall with a reactive barrier for passive in situ treatment of groundwater); surface water diversion structures, as needed; amend soils to provide a suitable growth medium combined with planting of suitable vegetation. Construction of an engineered repository for disposal of river bank, levee, and wetland removals.	Same as Alternative 2 except treatment of groundwater at a regional water treatment plant	Removal and disposal in an on-site regional repository	Groundwater cutoff walls; spot removals, soil treatment and re-vegetation	No action

[a] Regional repositories in Canyon Creek, Ninemile Creek, and along the South Fork Coeur d'Alene River, in addition to the Lower Basin
[b] Active water treatment assumes high-density sludge hydroxide precipitation with media filtration, processes that are similar to what is being used for the BHSS Central Treatment Plant. It is assumed that the regional treatment plant would be located near Pinehurst. Pipelines would be used in Canyon Creek, Ninemile Creek, and the South Fork Coeur d'Alene River to transport collected adit discharge and groundwater to the regional treatment plant. Collected groundwater from the Cataldo/Mission Flats dredge disposal area would be pumped to the regional treatment plant.
[c] One plant located near Pinehurst as for Alternative 3

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Sediments										
	C01B	Sediment Excavation								
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	19,000	$10.00	$190,000	$110,000	$0	$300,000
					Totals for TCD# C01B . . .		$290,000	$170,000	$0	$460,000
	C07	Local Repository Above Flood Level								
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$9.70	$97,000	$58,000	$22,000	$180,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	19,000	$9.70	$180,000	$110,000	$42,000	$340,000
					Totals for TCD# C07 . . .		$280,000	$170,000	$63,000	$510,000
					Totals for Floodplain Sediments . . .		*$570,000*	*$340,000*	*$63,000*	*$980,000*
Floodplain Tailings										
	C09	Tailings Impoundment Closure								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	AC	6	$170,000.00	$940,000	$570,000	$190,000	$1,700,000
					Totals for TCD# C09 . . .		$940,000	$570,000	$190,000	$1,700,000
					Totals for Floodplain Tailings . . .		*$940,000*	*$570,000*	*$190,000*	*$1,700,000*
Upland Tailings										
	C03	Low Permeability Cap								
		BUR173	TAMARACK MILLSITE	AC	1	$151,000.00	$150,000	$88,000	$18,000	$250,000
		OSB039	DAYROCK MINE	AC	1	$151,000.00	$110,000	$63,000	$13,000	$180,000
					Totals for TCD# C03 . . .		$250,000	$150,000	$32,000	$430,000
	C09	Tailings Impoundment Closure								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	3	$170,000.00	$430,000	$260,000	$85,000	$770,000
					Totals for TCD# C09 . . .		$430,000	$260,000	$85,000	$770,000
	C11	Hydraulic Isolation Using Slurry Wall								
		OSB044	SUCCESS MINE ROCK DUMP	LF	1,400	$280.00	$390,000	$240,000	$160,000	$780,000
					Totals for TCD# C11 . . .		$390,000	$240,000	$160,000	$780,000
					Totals for Upland Tailings . . .		*$1,100,000*	*$640,000*	*$270,000*	*$2,000,000*
Floodplain Waste Rock										
	C02a	Regrade/Consolidate/Revegetate								
		OSB032	DULUTH MINE BLACKCLOUD CK	AC	1	$56,000.00	$47,000	$28,000	$5,900	$81,000

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		OSB038	CALIFORNIA NO.4	AC	1	$56,000.00	$72,000	$43,000	$9,000	$120,000
		OSB082	MONARCH MINE BLACKCLOUD CK	AC	1	$56,000.00	$30,000	$18,000	$3,800	$52,000
						Totals for TCD# C02a . . .	**$150,000**	**$89,000**	**$19,000**	**$260,000**
						Totals for Floodplain Waste Rock . . .	*$150,000*	*$89,000*	*$19,000*	*$260,000*
Upland Waste Rock										
	C02a	Regrade/Consolidate/Revegetate								
		BUR052	LITTLE SUNSET MINE	AC	0	$56,000.00	$9,000	$5,400	$1,100	$15,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	21	$56,000.00	$1,200,000	$720,000	$150,000	$2,100,000
		BUR139	REX NO.1	AC	1	$56,000.00	$73,000	$44,000	$9,200	$130,000
		OSB033	RUTH MINE	AC	1	$56,000.00	$38,000	$23,000	$4,800	$66,000
		OSB115	OPTION MINE	AC	0	$56,000.00	$19,000	$11,000	$2,400	$33,000
		WAL006	NORTHSIDE MINE	AC	0	$56,000.00	$14,000	$8,400	$1,800	$24,000
						Totals for TCD# C02a . . .	**$1,400,000**	**$810,000**	**$170,000**	**$2,300,000**
	C02b	Regrade/Consolidate/Revegetate								
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	AC	8	$110,000.00	$930,000	$560,000	$120,000	$1,600,000
		BUR160	INTERSTATE-CALLAHAN LOWER ROCK DUMPS	AC	4	$110,000.00	$460,000	$280,000	$58,000	$800,000
		BUR170	TAMARACK 400 LEVEL	AC	1	$110,000.00	$100,000	$63,000	$13,000	$180,000
		BUR171	TAMARACK NO.5	AC	1	$110,000.00	$73,000	$44,000	$9,100	$130,000
		BUR172	TAMARACK UNNAMED ADIT	AC	0	$110,000.00	$47,000	$28,000	$5,900	$82,000
						Totals for TCD# C02b . . .	**$1,600,000**	**$970,000**	**$200,000**	**$2,800,000**
						Totals for Upland Waste Rock . . .	*$3,000,000*	*$1,800,000*	*$370,000*	*$5,100,000*
Adit Drainage										
	C10	Adit Drainage Collection								
		OSB089	SUCCESS NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
						Totals for TCD# C10 . . .	**$6,200**	**$3,700**	**$1,100**	**$11,000**
	PT-1a	Permeable Reactive Trench								
		OSB089	SUCCESS NO.3	CY	200	$440.00	$88,000	$53,000	$530,000	$670,000
						Totals for TCD# PT-1a . . .	**$88,000**	**$53,000**	**$530,000**	**$670,000**
						Totals for Adit Drainage . . .	*$94,000*	*$57,000*	*$530,000*	*$680,000*

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Groundwater										
	PT-1a	Permeable Reactive Trench								
		OSB044	SUCCESS MINE ROCK DUMP	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
					Totals for TCD# PT-1a . . .		$4,400	$2,600	$26,000	$33,000
					Totals for Groundwater . . .		*$4,400*	*$2,600*	*$26,000*	*$33,000*
General										
	ACC-1	Temporary Access Road								
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	3	$200,000.00	$500,000	$300,000	$0	$800,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
					Totals for TCD# ACC-1 . . .		$800,000	$480,000	$0	$1,300,000
	HAUL-1	Haul to Local Repository, 1/2 Mile One Way								
		LHAULNM	Hauling to Local Repository	CY-MI	5,000	$0.89	$4,500	$2,700	$0	$7,100
		LHAULNM	Hauling to Local Repository	CY-MI	9,500	$0.89	$8,500	$5,100	$0	$14,000
					Totals for TCD# HAUL-1 . . .		$13,000	$7,800	$0	$21,000
					Totals for General . . .		*$810,000*	*$490,000*	*$0*	*$1,300,000*
Buildings & Structures										
	HH-1	Fence waste pile/mill site								
		OSB039	DAYROCK MINE	LF	4,000	$25.00	$100,000	$60,000	$10,000	$170,000
					Totals for TCD# HH-1 . . .		$100,000	$60,000	$10,000	$170,000
					Totals for Buildings & Structures . . .		*$100,000*	*$60,000*	*$10,000*	*$170,000*
Bioengineering Actions										
	BSBR-AV	Bank Stabilization via Revetments - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	2,400	$83.00	$200,000	$120,000	$60,000	$380,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$83.00	$630,000	$380,000	$190,000	$1,200,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$83.00	$170,000	$100,000	$52,000	$330,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$83.00	$60,000	$36,000	$18,000	$110,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$83.00	$460,000	$280,000	$140,000	$880,000
					Totals for TCD# BSBR-AVG . . .		$1,500,000	$910,000	$460,000	$2,900,000

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	CD-AVG	**Current Deflector Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	29	$1,380.00	$40,000	$24,000	$12,000	$76,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	54	$1,380.00	$75,000	$45,000	$22,000	$140,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	15	$1,380.00	$21,000	$12,000	$6,200	$39,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	5	$1,380.00	$6,900	$4,100	$2,100	$13,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	40	$1,380.00	$55,000	$33,000	$17,000	$100,000
					Totals for TCD# CD-AVG . . .		**$200,000**	**$120,000**	**$59,000**	**$370,000**
	CD-SED	**Current Deflector Sediment Traps**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	3	$1,380.00	$4,100	$2,500	$24,000	$31,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	6	$1,380.00	$8,300	$5,000	$48,000	$61,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	2	$1,380.00	$2,800	$1,700	$16,000	$20,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	1	$1,380.00	$1,400	$830	$8,000	$10,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	4	$1,380.00	$5,500	$3,300	$32,000	$41,000
					Totals for TCD# CD-SED . . .		**$22,000**	**$13,000**	**$130,000**	**$160,000**
	CH REAL	**Channel Realignment**								
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	28,000	$29.00	$800,000	$480,000	$140,000	$1,400,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SY	74,000	$29.00	$2,100,000	$1,300,000	$380,000	$3,800,000
					Totals for TCD# CH REAL-1 . . .		**$2,900,000**	**$1,800,000**	**$520,000**	**$5,200,000**
	FP/RP-AV	**Floodplain and Riparian Replanting - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	SF	80,000	$0.94	$75,000	$45,000	$13,000	$130,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SF	380,000	$0.94	$350,000	$210,000	$62,000	$630,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SF	280,000	$0.94	$260,000	$160,000	$46,000	$460,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SF	100,000	$0.94	$97,000	$58,000	$17,000	$170,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SF	140,000	$0.94	$130,000	$81,000	$24,000	$240,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SF	560,000	$0.94	$520,000	$310,000	$91,000	$930,000
					Totals for TCD# FP/RP-AVG . . .		**$1,400,000**	**$870,000**	**$250,000**	**$2,600,000**
	VBS-AVG	**Vegetative Bank Stabilization - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$36.00	$140,000	$87,000	$43,000	$270,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$36.00	$270,000	$160,000	$82,000	$520,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$36.00	$74,000	$45,000	$22,000	$140,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$36.00	$26,000	$15,000	$7,700	$49,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$36.00	$200,000	$120,000	$60,000	$380,000

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source	Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
				Totals for TCD# VBS-AVG . . .		$720,000	$430,000	$210,000	$1,400,000
				Totals for Bioengineering Actions . . .		*$6,800,000*	*$4,100,000*	*$1,600,000*	*$13,000,000*
				Totals for Nine Mile Creek . . .		$14,000,000	$8,100,000	$3,100,000	$25,000,000

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Sediments										
	C01B	Sediment Excavation								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$10.00	$55,000	$33,000	$0	$88,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB039	DAYROCK MINE	CY	11,000	$10.00	$110,000	$66,000	$0	$180,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	17,000	$10.00	$170,000	$100,000	$0	$270,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$10.00	$130,000	$78,000	$0	$210,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$10.00	$330,000	$200,000	$0	$530,000
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$10.00	$8,000	$4,800	$0	$13,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	33,000	$10.00	$330,000	$200,000	$0	$530,000
					Totals for TCD# C01B . . .		**$1,400,000**	**$820,000**	**$0**	**$2,200,000**
	C07	Local Repository Above Flood Level								
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$9.70	$7,800	$4,700	$1,700	$14,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	33,000	$9.70	$320,000	$190,000	$72,000	$580,000
					Totals for TCD# C07 . . .		**$330,000**	**$200,000**	**$74,000**	**$600,000**
	C08	Regional Repository								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$16.00	$88,000	$53,000	$22,000	$160,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$16.00	$160,000	$96,000	$40,000	$300,000
		OSB039	DAYROCK MINE	CY	11,000	$16.00	$180,000	$110,000	$44,000	$330,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	17,000	$16.00	$270,000	$160,000	$68,000	$500,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$16.00	$160,000	$96,000	$40,000	$300,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$16.00	$26,000	$15,000	$6,400	$47,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$16.00	$210,000	$120,000	$52,000	$380,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$16.00	$26,000	$15,000	$6,400	$47,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$16.00	$530,000	$320,000	$130,000	$980,000
					Totals for TCD# C08 . . .		**$1,600,000**	**$990,000**	**$410,000**	**$3,000,000**
					Totals for Floodplain Sediments . . .		*$3,300,000*	*$2,000,000*	*$480,000*	*$5,800,000*

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Tailings										
	C09	Tailings Impoundment Closure								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	AC	6	$170,000.00	$940,000	$570,000	$190,000	$1,700,000
					Totals for TCD# C09 . . .		$940,000	$570,000	$190,000	$1,700,000
					Totals for Floodplain Tailings . . .		*$940,000*	*$570,000*	*$190,000*	*$1,700,000*
Upland Tailings										
	C01	Excavation								
		OSB039	DAYROCK MINE	CY	11,000	$2.70	$30,000	$18,000	$0	$48,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$2.70	$970,000	$580,000	$0	$1,600,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$2.70	$19,000	$11,000	$0	$30,000
					Totals for TCD# C01 . . .		$1,000,000	$610,000	$0	$1,600,000
	C07	Local Repository Above Flood Level								
		BUR055	INTERSTATE MILLSITE	CY	14,000	$9.70	$140,000	$81,000	$31,000	$250,000
		OSB039	DAYROCK MINE	CY	11,000	$9.70	$110,000	$64,000	$24,000	$190,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$9.70	$68,000	$41,000	$15,000	$120,000
					Totals for TCD# C07 . . .		$310,000	$190,000	$70,000	$570,000
	C08	Regional Repository								
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$16.00	$5,800,000	$3,500,000	$1,400,000	$11,000,000
					Totals for TCD# C08 . . .		$5,800,000	$3,500,000	$1,400,000	$11,000,000
	C09	Tailings Impoundment Closure								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	3	$170,000.00	$430,000	$260,000	$85,000	$770,000
					Totals for TCD# C09 . . .		$430,000	$260,000	$85,000	$770,000
					Totals for Upland Tailings . . .		*$7,500,000*	*$4,500,000*	*$1,600,000*	*$14,000,000*
Floodplain Waste Rock										
	C01	Excavation								
		OSB032	DULUTH MINE BLACKCLOUD CK	CY	4,000	$2.70	$11,000	$6,500	$0	$17,000
		OSB038	CALIFORNIA NO.4	CY	6,200	$2.70	$17,000	$10,000	$0	$27,000
		OSB082	MONARCH MINE BLACKCLOUD CK	CY	2,600	$2.70	$7,000	$4,200	$0	$11,000
					Totals for TCD# C01 . . .		$35,000	$21,000	$0	$55,000

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	C03	Low Permeability Cap								
		OSB032	DULUTH MINE BLACKCLOUD CK	AC	1	$151,000.00	$130,000	$76,000	$16,000	$220,000
		OSB038	CALIFORNIA NO.4	AC	1	$151,000.00	$190,000	$120,000	$24,000	$330,000
		OSB082	MONARCH MINE BLACKCLOUD CK	AC	1	$151,000.00	$82,000	$49,000	$10,000	$140,000
						Totals for TCD# C03 . . .	**$400,000**	**$240,000**	**$50,000**	**$690,000**
					Totals for Floodplain Waste Rock . . .		*$440,000*	*$260,000*	*$50,000*	*$750,000*
Upland Waste Rock										
	C01	Excavation								
		BUR052	LITTLE SUNSET MINE	CY	800	$2.70	$2,200	$1,300	$0	$3,500
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	690,000	$2.70	$1,900,000	$1,100,000	$0	$3,000,000
		OSB033	RUTH MINE	CY	3,200	$2.70	$8,600	$5,200	$0	$14,000
		OSB115	OPTION MINE	CY	40	$2.70	$110	$65	$0	$170
		WAL006	NORTHSIDE MINE	CY	40	$2.70	$110	$65	$0	$170
						Totals for TCD# C01 . . .	**$1,900,000**	**$1,100,000**	**$0**	**$3,000,000**
	C02a	Regrade/Consolidate/Revegetate								
		OSB044	SUCCESS MINE ROCK DUMP	AC	0	$56,000.00	$25,000	$15,000	$3,200	$43,000
						Totals for TCD# C02a . . .	**$25,000**	**$15,000**	**$3,200**	**$43,000**
	C02b	Regrade/Consolidate/Revegetate								
		BUR056	TAMARACK ROCK DUMPS	AC	13	$110,000.00	$1,500,000	$880,000	$180,000	$2,500,000
						Totals for TCD# C02b . . .	**$1,500,000**	**$880,000**	**$180,000**	**$2,500,000**
	C03	Low Permeability Cap								
		BUR052	LITTLE SUNSET MINE	AC	0	$151,000.00	$24,000	$14,000	$3,000	$42,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	21	$151,000.00	$3,200,000	$1,900,000	$400,000	$5,600,000
		BUR139	REX NO.1	AC	1	$151,000.00	$200,000	$120,000	$25,000	$340,000
		BUR170	TAMARACK 400 LEVEL	AC	1	$151,000.00	$140,000	$86,000	$18,000	$250,000
		BUR171	TAMARACK NO.5	AC	1	$151,000.00	$100,000	$60,000	$12,000	$170,000
		BUR172	TAMARACK UNNAMED ADIT	AC	0	$151,000.00	$65,000	$39,000	$8,100	$110,000
		OSB033	RUTH MINE	AC	1	$151,000.00	$100,000	$62,000	$13,000	$180,000
		OSB115	OPTION MINE	AC	0	$151,000.00	$51,000	$31,000	$6,400	$89,000
		WAL006	NORTHSIDE MINE	AC	0	$151,000.00	$38,000	$23,000	$4,700	$65,000
						Totals for TCD# C03 . . .	**$4,000,000**	**$2,400,000**	**$490,000**	**$6,800,000**

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	C04	Low Perm Cap w/Seepage Coll & Trmt								
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	AC	8	$170,000.00	$1,400,000	$860,000	$320,000	$2,600,000
		BUR160	INTERSTATE-CALLAHAN LOWER ROCK DUMPS	AC	4	$170,000.00	$710,000	$430,000	$160,000	$1,300,000
						Totals for TCD# C04 . . .	$2,200,000	$1,300,000	$480,000	$3,900,000
						Totals for Upland Waste Rock . . .	*$9,500,000*	*$5,700,000*	*$1,200,000*	*$16,000,000*
Adit Drainage										
	C10	Adit Drainage Collection								
		BUR051	SUNSET MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR058	TAMARACK NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR170	TAMARACK 400 LEVEL	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR171	TAMARACK NO.5	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB039	DAYROCK MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB088	ALAMEDA MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB089	SUCCESS NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
						Totals for TCD# C10 . . .	$50,000	$30,000	$8,700	$88,000
	PT-1a	Permeable Reactive Trench								
		BUR051	SUNSET MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR058	TAMARACK NO.3	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR170	TAMARACK 400 LEVEL	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR171	TAMARACK NO.5	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB039	DAYROCK MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB088	ALAMEDA MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
						Totals for TCD# PT-1a . . .	$31,000	$18,000	$180,000	$230,000
	TRMT-1	Media Filter Treatment Plant								
		OSB089	SUCCESS NO.3	GPM	16	$1,190.00	$19,000	$14,000	$37,000	$70,000
						Totals for TCD# TRMT-1 . . .	$19,000	$14,000	$37,000	$70,000
						Totals for Adit Drainage . . .	*$99,000*	*$62,000*	*$230,000*	*$390,000*

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
General										
	ACC-1	**Temporary Access Road**								
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	3	$200,000.00	$500,000	$300,000	$0	$800,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
					Totals for TCD# ACC-1 . . .		**$800,000**	**$480,000**	**$0**	**$1,300,000**
	HAUL-1	**Haul to Local Repository, 1/2 Mile One Way**								
		LHAULNM	Hauling to Local Repository	CY-MI	7,000	$0.89	$6,200	$3,700	$0	$10,000
		LHAULNM	Hauling to Local Repository	CY-MI	26,000	$0.89	$23,000	$14,000	$0	$37,000
					Totals for TCD# HAUL-1 . . .		**$29,000**	**$18,000**	**$0**	**$47,000**
	HAUL-2	**Haul to Regional Repository**								
		RHAULNM	Hauling to Regional Repository	CY-MI	70,000	$0.89	$62,000	$37,000	$0	$100,000
		RHAULNM	Hauling to Regional Repository	CY-MI	1,200,000	$0.89	$1,100,000	$650,000	$0	$1,700,000
		RHAULNM	Hauling to Regional Repository	CY-MI	44,000	$0.89	$39,000	$23,000	$0	$63,000
					Totals for TCD# HAUL-2 . . .		**$1,200,000**	**$720,000**	**$0**	**$1,900,000**
	PIPE-1	**Conveyance Pipeline-6"**								
		PIPENM02	Pipeline to Active Treatment	LF	8,200	$39.00	$320,000	$190,000	$24,000	$540,000
		PIPENM04	Pipeline to Active Treatment	LF	16,000	$39.00	$630,000	$380,000	$47,000	$1,100,000
					Totals for TCD# PIPE-1 . . .		**$950,000**	**$570,000**	**$71,000**	**$1,600,000**
					Totals for General . . .		*$3,000,000*	*$1,800,000*	*$71,000*	*$4,800,000*
Buildings & Structures										
	HH-3	**Decon millsite**								
		OSB039	DAYROCK MINE	LS	1	$100,000.00	$100,000	$60,000	$5,000	$170,000
					Totals for TCD# HH-3 . . .		**$100,000**	**$60,000**	**$5,000**	**$170,000**
					Totals for Buildings & Structures . . .		*$100,000*	*$60,000*	*$5,000*	*$170,000*
Bioengineering Actions										
	BSBR-AV	**Bank Stabilization via Revetments - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$83.00	$330,000	$200,000	$100,000	$630,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$83.00	$630,000	$380,000	$190,000	$1,200,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$83.00	$170,000	$100,000	$52,000	$330,000

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Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$83.00	$60,000	$36,000	$18,000	$110,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$83.00	$460,000	$280,000	$140,000	$880,000
					Totals for TCD# BSBR-AVG . . .		$1,700,000	$990,000	$500,000	$3,100,000
	CD-AVG	Current Deflector Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	48	$1,380.00	$66,000	$40,000	$20,000	$130,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	90	$1,380.00	$120,000	$75,000	$37,000	$240,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	EA	33	$1,380.00	$46,000	$27,000	$14,000	$87,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	25	$1,380.00	$35,000	$21,000	$10,000	$66,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	9	$1,380.00	$12,000	$7,500	$3,700	$24,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	67	$1,380.00	$92,000	$55,000	$28,000	$180,000
					Totals for TCD# CD-AVG . . .		$380,000	$230,000	$110,000	$710,000
	CD-SED	Current Deflector Sediment Traps								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	5	$1,380.00	$6,900	$4,100	$40,000	$51,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	10	$1,380.00	$14,000	$8,300	$80,000	$100,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	EA	4	$1,380.00	$5,500	$3,300	$32,000	$41,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	3	$1,380.00	$4,100	$2,500	$24,000	$31,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	1	$1,380.00	$1,400	$830	$8,000	$10,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	7	$1,380.00	$9,700	$5,800	$56,000	$71,000
					Totals for TCD# CD-SED . . .		$41,000	$25,000	$240,000	$310,000
	CH REAL	Channel Realignment								
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	28,000	$29.00	$800,000	$480,000	$140,000	$1,400,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SY	9,600	$29.00	$280,000	$170,000	$49,000	$490,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SY	74,000	$29.00	$2,100,000	$1,300,000	$380,000	$3,800,000
					Totals for TCD# CH REAL-1 . . .		$3,200,000	$1,900,000	$560,000	$5,700,000
	FP/RP-AV	Floodplain and Riparian Replanting - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	SF	200,000	$0.94	$190,000	$110,000	$33,000	$330,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SF	380,000	$0.94	$350,000	$210,000	$62,000	$630,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SF	460,000	$0.94	$440,000	$260,000	$76,000	$770,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SF	140,000	$0.94	$140,000	$82,000	$24,000	$240,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SF	140,000	$0.94	$130,000	$81,000	$24,000	$240,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SF	670,000	$0.94	$630,000	$380,000	$110,000	$1,100,000
					Totals for TCD# FP/RP-AVG . . .		$1,900,000	$1,100,000	$330,000	$3,300,000

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	OFFCH-A	**Off-Channel Hydrologic Feature Average Cost**								
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SY	350	$29.00	$10,000	$6,000	$1,800	$18,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SY	1,300	$29.00	$38,000	$23,000	$6,700	$68,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	2,000	$29.00	$57,000	$34,000	$10,000	$100,000
					Totals for TCD# OFFCH-AVG . . .		**$110,000**	**$63,000**	**$18,000**	**$190,000**
	VBS-AVG	**Vegetative Bank Stabilization - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$36.00	$140,000	$87,000	$43,000	$270,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$36.00	$270,000	$160,000	$82,000	$520,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	LF	3,200	$36.00	$120,000	$70,000	$35,000	$220,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$36.00	$74,000	$45,000	$22,000	$140,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$36.00	$26,000	$15,000	$7,700	$49,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$36.00	$200,000	$120,000	$60,000	$380,000
					Totals for TCD# VBS-AVG . . .		**$830,000**	**$500,000**	**$250,000**	**$1,600,000**
					Totals for Bioengineering Actions . . .		*$8,100,000*	*$4,900,000*	*$2,000,000*	*$15,000,000*
					Totals for Nine Mile Creek . . .		**$33,000,000**	**$20,000,000**	**$5,800,000**	**$59,000,000**

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Sediments										
	C01B	Sediment Excavation								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$10.00	$55,000	$33,000	$0	$88,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB039	DAYROCK MINE	CY	22,000	$10.00	$220,000	$130,000	$0	$350,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	19,000	$10.00	$190,000	$110,000	$0	$300,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$10.00	$130,000	$78,000	$0	$210,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$10.00	$330,000	$200,000	$0	$530,000
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$10.00	$8,000	$4,800	$0	$13,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	34,000	$10.00	$340,000	$200,000	$0	$540,000
					Totals for TCD# C01B . . .		**$1,500,000**	**$900,000**	**$0**	**$2,400,000**
	C08	Regional Repository								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$10.80	$59,000	$36,000	$12,000	$110,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.80	$110,000	$65,000	$22,000	$190,000
		OSB039	DAYROCK MINE	CY	22,000	$10.80	$240,000	$140,000	$48,000	$430,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	19,000	$10.80	$210,000	$120,000	$41,000	$370,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$10.80	$110,000	$65,000	$22,000	$190,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$10.80	$17,000	$10,000	$3,500	$31,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$10.80	$140,000	$84,000	$28,000	$250,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$10.80	$17,000	$10,000	$3,500	$31,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$10.80	$360,000	$210,000	$71,000	$640,000
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$10.80	$8,600	$5,200	$1,700	$16,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	34,000	$10.80	$370,000	$220,000	$73,000	$660,000
					Totals for TCD# C08 . . .		**$1,600,000**	**$980,000**	**$330,000**	**$2,900,000**
					Totals for Floodplain Sediments . . .		*$3,100,000*	*$1,900,000*	*$330,000*	*$5,300,000*
Floodplain Tailings										
	C01	Excavation								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	CY	200,000	$2.70	$540,000	$320,000	$0	$860,000
					Totals for TCD# C01 . . .		**$540,000**	**$320,000**	**$0**	**$860,000**

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Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	C08	Regional Repository								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	CY	200,000	$10.80	$2,200,000	$1,300,000	$430,000	$3,900,000
					Totals for TCD# C08 . . .		**$2,200,000**	**$1,300,000**	**$430,000**	**$3,900,000**
					Totals for Floodplain Tailings . . .		*$2,700,000*	*$1,600,000*	*$430,000*	*$4,800,000*
Upland Tailings										
	C01	Excavation								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	230,000	$2.70	$610,000	$360,000	$0	$970,000
		BUR055	INTERSTATE MILLSITE	CY	14,000	$2.70	$38,000	$23,000	$0	$60,000
		OSB039	DAYROCK MINE	CY	11,000	$2.70	$30,000	$18,000	$0	$48,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$2.70	$970,000	$580,000	$0	$1,600,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$2.70	$19,000	$11,000	$0	$30,000
					Totals for TCD# C01 . . .		**$1,700,000**	**$1,000,000**	**$0**	**$2,700,000**
	C08	Regional Repository								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	230,000	$10.80	$2,400,000	$1,500,000	$490,000	$4,400,000
		BUR055	INTERSTATE MILLSITE	CY	14,000	$10.80	$150,000	$91,000	$30,000	$270,000
		OSB039	DAYROCK MINE	CY	11,000	$10.80	$120,000	$71,000	$24,000	$210,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$10.80	$3,900,000	$2,300,000	$780,000	$7,000,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$10.80	$76,000	$45,000	$15,000	$140,000
					Totals for TCD# C08 . . .		**$6,700,000**	**$4,000,000**	**$1,300,000**	**$12,000,000**
					Totals for Upland Tailings . . .		*$8,300,000*	*$5,000,000*	*$1,300,000*	*$15,000,000*
Floodplain Waste Rock										
	C01	Excavation								
		OSB032	DULUTH MINE BLACKCLOUD CK	CY	20,000	$2.70	$54,000	$32,000	$0	$86,000
		OSB038	CALIFORNIA NO.4	CY	31,000	$2.70	$84,000	$50,000	$0	$130,000
		OSB082	MONARCH MINE BLACKCLOUD CK	CY	13,000	$2.70	$35,000	$21,000	$0	$56,000
					Totals for TCD# C01 . . .		**$170,000**	**$100,000**	**$0**	**$280,000**
	C08	Regional Repository								
		OSB032	DULUTH MINE BLACKCLOUD CK	CY	20,000	$10.80	$220,000	$130,000	$43,000	$390,000
		OSB038	CALIFORNIA NO.4	CY	31,000	$10.80	$330,000	$200,000	$67,000	$600,000
		OSB082	MONARCH MINE BLACKCLOUD CK	CY	13,000	$10.80	$140,000	$84,000	$28,000	$250,000
					Totals for TCD# C08 . . .		**$690,000**	**$410,000**	**$140,000**	**$1,200,000**

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
					Totals for Floodplain Waste Rock . . .		*$860,000*	*$520,000*	*$140,000*	*$1,500,000*
Upland Waste Rock										
	C01	Excavation								
		BUR052	LITTLE SUNSET MINE	CY	4,000	$2.70	$11,000	$6,500	$0	$17,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	690,000	$2.70	$1,900,000	$1,100,000	$0	$3,000,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	75,000	$2.70	$200,000	$120,000	$0	$320,000
		BUR056	TAMARACK ROCK DUMPS	CY	290,000	$2.70	$790,000	$470,000	$0	$1,300,000
		BUR170	TAMARACK 400 LEVEL	CY	11,000	$2.70	$30,000	$18,000	$0	$48,000
		OSB033	RUTH MINE	CY	16,000	$2.70	$43,000	$26,000	$0	$69,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	17,000	$2.70	$46,000	$28,000	$0	$73,000
		OSB115	OPTION MINE	CY	200	$2.70	$540	$320	$0	$860
		WAL006	NORTHSIDE MINE	CY	200	$2.70	$540	$320	$0	$860
					Totals for TCD# C01 . . .		**$3,000,000**	**$1,800,000**	**$0**	**$4,800,000**
	C02a	Regrade/Consolidate/Revegetate								
		BUR051	SUNSET MINE	AC	2	$56,000.00	$100,000	$61,000	$13,000	$170,000
		BUR057	TAMARACK NO.4	AC	1	$56,000.00	$51,000	$31,000	$6,400	$88,000
		BUR058	TAMARACK NO.3	AC	1	$56,000.00	$54,000	$33,000	$6,800	$94,000
		BUR059	TAMARACK NO.1 & NO.2 (CUSTER MINE)	AC	2	$56,000.00	$97,000	$58,000	$12,000	$170,000
		BUR060	SUCCESS NO.2	AC	2	$56,000.00	$120,000	$72,000	$15,000	$210,000
		BUR061	SUCCESS NO.1	AC	1	$56,000.00	$80,000	$48,000	$9,900	$140,000
		BUR062	SUCCESS MINE ADJACENT DISTURBANCE	AC	1	$56,000.00	$38,000	$23,000	$4,800	$66,000
		BUR077	LACLEDE MINE	AC	1	$56,000.00	$64,000	$38,000	$8,000	$110,000
		BUR081	GUELPH MINE	AC	1	$56,000.00	$34,000	$20,000	$4,300	$59,000
		BUR082	UNIDENTIFIED DISTURBANCE	AC	0	$56,000.00	$24,000	$14,000	$2,900	$41,000
		BUR083	AMBERGRIS MINE	AC	0	$56,000.00	$18,000	$11,000	$2,200	$31,000
		BUR084	HERCULES NO. 2 (NINEMILE)	AC	0	$56,000.00	$15,000	$9,100	$1,900	$26,000
		BUR196	INDUS CLAIM UNNAMED ADIT	AC	0	$56,000.00	$17,000	$10,000	$2,200	$30,000
		BUR197	MEDICO CLAIM UNNAMED ADIT	AC	0	$56,000.00	$26,000	$15,000	$3,200	$44,000
		BUR205	TAMARACK UNNAMED ADJACENT ROCK DUM	AC	1	$56,000.00	$36,000	$22,000	$4,600	$63,000
		OSB031	IDAHO GALENA PROSPECT	AC	1	$56,000.00	$31,000	$19,000	$3,900	$54,000
		OSB034	MCDONALD MINE	AC	0	$56,000.00	$17,000	$10,000	$2,100	$29,000
		OSB035	UNIDENTIFIED DISTURBANCE	AC	0	$56,000.00	$27,000	$16,000	$3,400	$47,000
		OSB036	UNIDENTIFIED DISTURBANCE	AC	0	$56,000.00	$14,000	$8,400	$1,800	$24,000

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		OSB037	UNNAMED ADIT	AC	1	$56,000.00	$40,000	$24,000	$5,000	$69,000
		OSB039	DAYROCK MINE	AC	12	$56,000.00	$660,000	$400,000	$82,000	$1,100,000
		OSB041	GALENA NO. 2	AC	1	$56,000.00	$46,000	$28,000	$5,700	$79,000
		OSB042	NINEMILE MINING COMPANY NO.2	AC	0	$56,000.00	$11,000	$6,400	$1,300	$18,000
		OSB043	MAYFLOWER NO.3	AC	1	$56,000.00	$75,000	$45,000	$9,400	$130,000
		OSB045	ALAMEDA PROSPECT	AC	1	$56,000.00	$47,000	$28,000	$5,900	$81,000
		OSB046	LANSING MINE (ALBION)	AC	0	$56,000.00	$20,000	$12,000	$2,500	$34,000
		OSB048	AMERICAN MINE	AC	0	$56,000.00	$8,400	$5,000	$1,100	$14,000
		OSB049	TREASURE VAULT	AC	1	$56,000.00	$31,000	$18,000	$3,900	$53,000
		OSB055	SILVER STAR MINE	AC	0	$56,000.00	$20,000	$12,000	$2,500	$35,000
		OSB081	NINEMILE MINING COMPANY NO.1	AC	0	$56,000.00	$7,800	$4,700	$980	$14,000
		OSB083	BLACKCLOUD NO.3	AC	1	$56,000.00	$43,000	$26,000	$5,400	$74,000
		OSB087	UNNAMED TUNNEL	AC	0	$56,000.00	$5,600	$3,400	$700	$9,700
		OSB114	UNNAMED ADIT	AC	0	$56,000.00	$12,000	$7,400	$1,500	$21,000
		OSB116	PANHANDLE MINE	AC	0	$56,000.00	$17,000	$10,000	$2,200	$30,000
		WAL069	SIERRA SILVER MINE	AC	0	$56,000.00	$13,000	$8,100	$1,700	$23,000
		WAL075	UNNAMED ADIT	AC	0	$56,000.00	$5,000	$3,000	$630	$8,700
		WAL078	UNNAMED ADIT	AC	0	$56,000.00	$15,000	$9,100	$1,900	$26,000
					Totals for TCD# C02a . . .		**$1,900,000**	**$1,200,000**	**$240,000**	**$3,300,000**
	C07	**Local Repository Above Flood Level**								
		BUR052	LITTLE SUNSET MINE	CY	4,000	$9.70	$39,000	$23,000	$8,700	$71,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	690,000	$9.70	$6,700,000	$4,000,000	$1,500,000	$12,000,000
					Totals for TCD# C07 . . .		**$6,800,000**	**$4,100,000**	**$1,500,000**	**$12,000,000**
	C08	**Regional Repository**								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	75,000	$10.80	$810,000	$490,000	$160,000	$1,500,000
		BUR056	TAMARACK ROCK DUMPS	CY	290,000	$10.80	$3,200,000	$1,900,000	$630,000	$5,700,000
		BUR170	TAMARACK 400 LEVEL	CY	11,000	$10.80	$120,000	$71,000	$24,000	$210,000
		OSB033	RUTH MINE	CY	16,000	$10.80	$170,000	$100,000	$35,000	$310,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	17,000	$10.80	$180,000	$110,000	$37,000	$330,000
		OSB115	OPTION MINE	CY	200	$10.80	$2,200	$1,300	$430	$3,900
		WAL006	NORTHSIDE MINE	CY	200	$10.80	$2,200	$1,300	$430	$3,900
					Totals for TCD# C08 . . .		**$4,500,000**	**$2,700,000**	**$890,000**	**$8,000,000**

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
					Totals for Upland Waste Rock . . .		*$16,000,000*	*$9,700,000*	*$2,700,000*	*$28,000,000*
Adit Drainage										
	C10	**Adit Drainage Collection**								
		BUR051	SUNSET MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR058	TAMARACK NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR081	GUELPH MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR170	TAMARACK 400 LEVEL	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR171	TAMARACK NO.5	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB039	DAYROCK MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB055	SILVER STAR MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB088	ALAMEDA MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB089	SUCCESS NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
					Totals for TCD# C10 . . .		**$68,000**	**$41,000**	**$12,000**	**$120,000**
	PT-1a	**Permeable Reactive Trench**								
		BUR051	SUNSET MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR058	TAMARACK NO.3	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR081	GUELPH MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR170	TAMARACK 400 LEVEL	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR171	TAMARACK NO.5	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB039	DAYROCK MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB055	SILVER STAR MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB088	ALAMEDA MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
					Totals for TCD# PT-1a . . .		**$44,000**	**$26,000**	**$260,000**	**$330,000**
	TRMT-1	**Media Filter Treatment Plant**								
		OSB089	SUCCESS NO.3	GPM	16	$1,850.00	$29,000	$22,000	$58,000	$110,000
					Totals for TCD# TRMT-1 . . .		**$29,000**	**$22,000**	**$58,000**	**$110,000**
					Totals for Adit Drainage . . .		*$140,000*	*$89,000*	*$330,000*	*$560,000*

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
General										
	ACC-1	**Temporary Access Road**								
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$200,000	$120,000	$0	$320,000
		ACCESSNM	Road construction required to access remote source area	MI	5	$200,000.00	$1,000,000	$600,000	$0	$1,600,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$200,000	$120,000	$0	$320,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$200,000	$120,000	$0	$320,000
					Totals for TCD# ACC-1 . . .		**$1,600,000**	**$960,000**	**$0**	**$2,600,000**
	HAUL-1	**Haul to Local Repository, 1/2 Mile One Way**								
		LHAULNM	Hauling to Local Repository	CY-MI	350,000	$0.89	$310,000	$190,000	$0	$500,000
					Totals for TCD# HAUL-1 . . .		**$310,000**	**$190,000**	**$0**	**$500,000**
	HAUL-2	**Haul to Regional Repository**								
		RHAULNM	Hauling to Regional Repository	CY-MI	70,000	$0.89	$62,000	$37,000	$0	$100,000
		RHAULNM	Hauling to Regional Repository	CY-MI	3,100,000	$0.89	$2,800,000	$1,700,000	$0	$4,500,000
		RHAULNM	Hauling to Regional Repository	CY-MI	390,000	$0.89	$350,000	$210,000	$0	$550,000
					Totals for TCD# HAUL-2 . . .		**$3,200,000**	**$1,900,000**	**$0**	**$5,100,000**
	PIPE-1	**Conveyance Pipeline-6"**								
		PIPENM02	Pipeline to Active Treatment	LF	8,200	$39.00	$320,000	$190,000	$24,000	$540,000
		PIPENM04	Pipeline to Active Treatment	LF	16,000	$39.00	$630,000	$380,000	$47,000	$1,100,000
					Totals for TCD# PIPE-1 . . .		**$950,000**	**$570,000**	**$71,000**	**$1,600,000**
					Totals for General . . .		*$6,100,000*	*$3,600,000*	*$71,000*	*$9,800,000*
Buildings & Structures										
	HH-4	**Demolition/Disposal of Buildings & Structures**								
		OSB039	DAYROCK MINE	CY	10,000	$120.00	$1,200,000	$720,000	$150,000	$2,100,000
					Totals for TCD# HH-4 . . .		**$1,200,000**	**$720,000**	**$150,000**	**$2,100,000**
					Totals for Buildings & Structures . . .		*$1,200,000*	*$720,000*	*$150,000*	*$2,100,000*
Bioengineering Actions										
	BSBR-AV	**Bank Stabilization via Revetments - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$83.00	$330,000	$200,000	$100,000	$630,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$83.00	$630,000	$380,000	$190,000	$1,200,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$83.00	$170,000	$100,000	$52,000	$330,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$83.00	$60,000	$36,000	$18,000	$110,000

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Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$83.00	$460,000	$280,000	$140,000	$880,000
					Totals for TCD# BSBR-AVG . . .		$1,700,000	$990,000	$500,000	$3,100,000
	CD-AVG	Current Deflector Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	40	$1,380.00	$55,000	$33,000	$17,000	$100,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	76	$1,380.00	$100,000	$63,000	$31,000	$200,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	EA	37	$1,380.00	$51,000	$31,000	$15,000	$97,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	21	$1,380.00	$29,000	$17,000	$8,700	$55,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	7	$1,380.00	$9,700	$5,800	$2,900	$18,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	56	$1,380.00	$77,000	$46,000	$23,000	$150,000
					Totals for TCD# CD-AVG . . .		$330,000	$200,000	$98,000	$620,000
	CH REAL	Channel Realignment								
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	28,000	$29.00	$800,000	$480,000	$140,000	$1,400,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SY	9,600	$29.00	$280,000	$170,000	$49,000	$490,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SY	74,000	$29.00	$2,100,000	$1,300,000	$380,000	$3,800,000
					Totals for TCD# CH REAL-1 . . .		$3,200,000	$1,900,000	$560,000	$5,700,000
	FP/RP-AV	Floodplain and Riparian Replanting - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	SF	200,000	$0.94	$190,000	$110,000	$33,000	$330,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SF	380,000	$0.94	$350,000	$210,000	$62,000	$630,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SF	460,000	$0.94	$440,000	$260,000	$76,000	$770,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SF	140,000	$0.94	$140,000	$82,000	$24,000	$240,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SF	140,000	$0.94	$130,000	$81,000	$24,000	$240,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SF	670,000	$0.94	$630,000	$380,000	$110,000	$1,100,000
					Totals for TCD# FP/RP-AVG . . .		$1,900,000	$1,100,000	$330,000	$3,300,000
	OFFCH-A	Off-Channel Hydrologic Feature Average Cost								
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SY	370	$29.00	$11,000	$6,400	$1,900	$19,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SY	1,300	$29.00	$38,000	$23,000	$6,700	$68,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	2,400	$29.00	$69,000	$41,000	$12,000	$120,000
					Totals for TCD# OFFCH-AVG . . .		$120,000	$71,000	$21,000	$210,000
	VBS-AVG	Vegetative Bank Stabilization - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$36.00	$140,000	$87,000	$43,000	$270,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$36.00	$270,000	$160,000	$82,000	$520,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	LF	4,600	$36.00	$170,000	$100,000	$50,000	$320,000

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$36.00	$74,000	$45,000	$22,000	$140,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$36.00	$26,000	$15,000	$7,700	$49,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$36.00	$200,000	$120,000	$60,000	$380,000
					Totals for TCD# VBS-AVG . . .		**$880,000**	**$530,000**	**$260,000**	**$1,700,000**
					Totals for Bioengineering Actions . . .		*$8,100,000*	*$4,800,000*	*$1,800,000*	*$15,000,000*
					Totals for Nine Mile Creek . . .		**$47,000,000**	**$28,000,000**	**$7,200,000**	**$82,000,000**

Table 8.2-8
Summary of Estimated Costs for Removal, Containment, and Treatment TCDs
Alternatives 2, 3, and 4

TCD	Description	Unit	Direct Capital Costs	Indirect Capital Costs	Annual O&M Costs
Removal and Containment TCDs					
C1	Excavation	CY	$2.70	$ 1.60	$ 0
C1a	Excavation Below Water Table	CY	$26.00	$ 16.00	$ 0
C1b	Sediment Excavation	CY	$10.00	$6.00	$0
C2a	Regrade/Consolidate/Revegetate	AC	$56,000	$34,000	$565
C2b	Regrade/Consolidate/Revegetate	AC	$110,000	$66,000	$1,100
C2c	Erosion Protection	AC	$11,000	$6,600	$200
C3	Low Permeability GCL Cap	AC	$151,000	$91,000	$1,500
C4	Low Permeability GCL Cap w/Seepage Coll & Trmt	AC	$170,000	$100,000	$3,100
C5	Low Permeability GCL Cap w/Erosion Protection	AC	$170,000	$100,000	$3,100
C6*	Local Repository w/Erosion Protection	CY	$10.40	$6.20	$0.19
C7*	Local Repository Above Flood Level	CY	$9.70	$5.80	$0.18
C8a*	Regional Repository, 1 million cy	CY	$13.10	$7.90	$0.24
C8b*	Regional Repository, 10 million cy	CY	$7.70	$4.60	$0.11
C8c*	Regional Repository, 50 million cy	CY	$6.20	$3.70	$0.07
C9	Tailings Impoundment Closure	AC	$170,000	$100,000	$2,700
C10	Adit Drainage Collection	LS	$6,200	$3,700	$88
C11	Hydraulic Isolation Using Slurry Wall	LF	$280	$168	$9
C12	Hydraulic Isolation Using Lined Channel	LF	$500	$300	$16.10
OTHER					
HAUL-1	Haul to Repository	CY-MI	$0.89	$0.53	$0
ACC-1	Temporary Access Road	MI	$200,000	$120,000	Assume road will not be maintained.
Active Treatment TCDs					
CONVEYANCE					
PIPE-1	Conveyance Pipeline-6"	LF	$39	$23.00	$0.24
PIPE-2	Conveyance Pipeline-12"	LF	$58	$35	$0.35
PIPE-3	Conveyance Pipeline-24"	LF	$94	$56	$0.57
PIPE-4	HDPE Conveyance Pipeline Cost Factor, $/dia- in.	DIA IN	$5.10	$3.10	$0.03
PRIMARY ACTIVE TREATMENT: HIGH DENSITY SLUDGE HYDROXIDE PRECIPITATION					
Variations with Media Filtration					
TRMT-1a	5,000 gpm	GPM	$2,180	$1,640	$352
TRMT-1b	45,000 gpm	GPM	$1,190	$893	$192
TRMT-2a	w/Sulfide Feed - 5,000 gpm	GPM	$2,270	$1,700	$366
TRMT-2b	w/Sulfide Feed - 45,000 gpm	GPM	$1,230	$923	$198
Variations with Microfiltration					
TRMT-3a	5,000 gpm	GPM	$3,550	$2,660	$573
TRMT-3b	45,000 gpm	GPM	$2,580	$1,940	$416
TRMT-4a	w/Sulfide Feed - 5,000 gpm	GPM	$3,650	$2740	$589
TRMT-4b	w/Sulfide Feed - 45,000 gpm	GPM	$2,620	$1970	$423

Table 8.2-8 (Continued)
Summary of Estimated Costs for Removal, Containment, and Treatment TCDs
Alternatives 2, 3, and 4

TCD	Description	Unit	Direct Capital Costs	Indirect Capital Costs	Annual O&M Costs
Passive and In-Situ Treatment TCDs					
PASSIVE TREATMENT					
PT-1a	Permeable Reactive Trench w/Apatite	CY	$440	$264	$213
PT-1b	Permeable Reactive Trench w/Organic Mixture	CY	$51	$31	$45
PT-2a	Permeable Reactive Bed w/Apatite	CY	$530	$318	$256
PT-2b	Permeable Reactive Bed w/Organic Mixture	CY	$53	$32	$47
PT-3	Aerobic Wetland	MSF	$2,700	$1,600	$436
PT-4	Anaerobic Wetland	MSF	$7,700	$4,600	$5,800
IN-SITU TREATMENT					
PT-5a	Shallow Soil Mixing	CY	$12	$7.20	$0.20
PT-5b	Deep Soil Mixing w/Deep Tiller	CY	$16	$9.60	$0.30
PT-5c	Deep Soil Mixing w/Excavator	CY	$22	$13	$0.40
PT-5d	Deep Soil Mixing w/Auger	CY	$52	$31	$1.10
PT-6a	Underwater Applied with Barge	MSF	$840	$504	$16.90
PT-6b	Underwater Applied with Spreader or Diffuser	MSF	$850	$510	$17
PT-6c	Underwater Applied w/ Spray Equipment from Shore	MSF	$820	$492	$16.50
Human Health TCDs					
HH1	Access Restrictions (Fence)	LF	$25	$15	$0.20
HH2	Upland Waste Pile Soil Cover	AC	$43,000	$26,000	$433
HH3	Millsite Decontamination	LS	$100,000	$60,000	$403
HH4	Millsite Demolition/Disposal	CY	$120	$72	$1.20

* Does not include haul costs

Notes:
AC - acre
CY - cubic yard
CY-MI - cubic yard - mile
DIA INCH - diameter inch
EA - each
GPM - gallons per minute
LF - linear foot
LS - lump sum
MI - mile
MSF - thousand square feet

Table 8.2-9
Summary of Estimated Bioengineering TCD Costs

Unit Price Code/TCD	Description	Unit	Direct Capital Costs	Indirect Capital Costs	Annual O&M Costs
Current Deflectors					
CD-1	Current Deflector-Groynes (Spur Dikes, Spurs)	EA	$1,330	$798	$31
CD-2	Current Deflector-Bank Deflector with Root Wad	EA	$1,160	$696	$28
CD-3	Current Deflector-Riprap Groynes	EA	$1,260	$756	$31
CD-4	Current Deflector-Log Weir & Dam Structure	EA	$1,850	$1,100	$45
CD-5	Current Deflector-Angled Vortex Rock Weir w/Rootwads	EA	$1,260	$756	$31
CD-6	Current Deflector-Riprap Turning Rock Wall	EA	$1,470	$882	$36
CD-7	Current Deflector-Riprap Tieback	EA	$1,350	$810	$33
CD-Avg	Current Deflector Average Cost	EA	$1,380	$828	$33
Vegetative Bank Stabilization					
VBS-1	Brush Mattress w/Rock Toe	LF	$37	$22	$0.90
VBS-2	Brush Layer	LF	$19	$11	$0.50
VBS-3	Live Stake, Live Post & Joint Planted Fascines	LF	$53	$32	$1.30
VBS-Avg	Category Average	LF	$36	$22	$0.88
Bank Stabilization Using Bioengineered Revetments					
BSBR-1	Vegetated Geogrid	LF	$75	$45	$1.90
BSBR-2	Live Cribwall	LF	$140	$84	$3.40
BSBR-3	Low Energy Tree Revetment	LF	$41	$25	$0.99
BSBR-4	Moderate Energy Tree Revetment	LF	$70	$42	$1.70
BSBR-5	Tree Deflector	LF	$62	$37	$1.50
BSBR-6	Woody Debris & Vegetated Geogrid System	LF	$110	$66	$2.70
BSRB-Avg	Category Average	LF	$80	$50	$1.90
Floodplain/Riparian Planting					
FP/RP-1	Floodplain/Riparian Planting	SF	$0.39	$0.20	$0.01
FP/RP-2	Floodplain Planting	SF	$1.49	$0.89	$0.02
FP/RP-Avg	Category Average	SF	$0.94	$0.56	$0.01
Off-Channel Hydrologic Features					
OFFCH-1	Groundwater-Fed Side Channel	SY	$17	$10	$0.20
OFFCH-2	Surface-Fed Side Channel	SY	$29	$17	$0.40
OFFCH-3	Off-Channel Pond	SY	$42	$25	$0.59
OFFCH-Avg	Category Average	SY	$29	$17	$0.40
Channel Realignment					
CH REAL-1	Channel Realignment	SY	$29	$17	$0.40

Table 8.2-9 (Continued)
Summary of Estimated Bioengineering TCD Costs

Notes:
EA - each
LF - linear foot
SF - square foot
SY - square yard

Table 8.2-10
Description of Alternative 5 (State of Idaho) TCDs and Estimated Unit Costs

DEQ Design	Action	Estimated Unit Costs*			Assumptions
		Direct Capital Costs	Indirect Costs	O&M Costs	
1	Excavate waste and dispose locally	$8.50/cy	$5.10	$0	Consists of $3.50/cy for excavation of dry materials and $5/cy for a 1-hr rt haul.
2	Excavate waste or soil and dispose in region landfill	$18.50/cy	$11	$0	Consists of $3.50/cy for excavation of dry materials and $15/cy for a 3-hr rt haul.
3	Excavate stream sediments or banks and dispose	$19.50/cy	$12	$0	Consists of $3.50/cy for excavation of wet materials and $15/cy for a 3-hr rt haul plus $1/cy for access improvements and dewatering or water controls.
4	General grading	$2/cy	$1.20	$0.02	Assumes regrade an average 3' depth over area.
5	Relocate	$6/cy	$3.60	$0.06	Consists of moving waste from drainages onto high ground, soil cover, rip-rap toe protection and stream stabilization.
6	Toe stabilization	$50 lf	$30	$0.91	Assumes rip-rap 10' up slope w/ 3' diameter rock.
7	Cap - general	$16.50/cy	$9.90	$0.17	Includes $15/cy delivered material and $1.50/cy for spreading and grading.
8	Cap - low permeability	$20.50/cy	$12	$0.21	Includes $18.50/cy delivered material and $2.50/cy for spreading, grading and compacting.
9	Cap - geocover system	$45,000	$27,000	$820	Consists of 6" subgrade @ $2/cy, geosynthetic liner @ $3/sy, 12" drain layer @ $6/cy, surface water control @ $0.25/sy, and soil and vegetation @ $11/cy.
10	Upland vegetation	$5,000/ac	$3,000	$50	Mechanical planting for erosion control.
11	Wetland vegetation	$11,000/ac	$6,600	$160	Hand/mechanical planting for stabilization, biofiltration and habitat.
12	Streamwork - Riprap	$13/lf	$7.80	$0.21	Assumes 3' up the slope or river bank if for erosion control. In-stream rock structures for habitat improvement.
13	Bioengineering streambanks	$40/lf	$24	$0.97	Includes a combination of plantings, soil wraps, root wads, matting, rip-rap, sills, barbs and other hydraulic features @ $30/lf plus streambank preparation @ $10/lf.
14	Excavate river bed, bank wedges and floodplain by barge	$50/cy	$30	$0.81	Consists of excavation from a barge @ $30/cy, dewatering and access improvements @ $2/cy and a three hours haul @ $18/cy. Wedges assumed as 1 cy/lf.
15	Bioengineering streambank wedge after excavation	$30/lf	$18	$0.73	Includes a combination of plantings, soil wraps, root wads, matting, rip-rap, sills, barbs and other hydraulic features. Assumes that excavation prepared banks.
16	Bioengineering streambank w/o excavation	$60/lf	$36	$1.50	Includes grading of banks @ $30/lf plus a combination of plantings, soil wraps, root wads, matting, rip-rap, sills, barbs and other hydraulic features @ $30/lf. Assumes difficult access or access by barge.
17	Adit Closure	$62,000	$37,000	$880	Includes gate or barrier and water collection and conveyance system.
18	Adit Water Treatment	$1,000,000	$600,000	$60,000	Unit cost is based upon bid specifications for the Success treatment project and scaled up to

Table 8.2-10 (continued)
Description of Alternative 5 (State of Idaho) TCDs and Estimated Unit Costs

DEQ Design	Action	Estimated Unit Costs[a]			Assumptions
		Direct Capital Costs	Indirect Costs	O&M Costs	
					a 1cfs adit discharge.
19	Groundwater Cutoff	$150/lf	$90	$4.80	Unit cost is EPA's estimate for LB-3C.
20	Soil Amendment	$20,000/ac	$12,000	$400	Unit cost is based upon EPA's estimate of $1,600/cy assuming mixing of the top one foot.
21	Subaqueous Capping/Treatment	$37,000/ac	$22,000	$750	Equivalent to EPA's $850/1000 sf. Capping material may include soil, biosolids, or chemical amendment
22	Mill Site Demolition	$250,000	$150,000	$2,500	Based upon Bunker Hill industrial complex demolition costs for buildings. Costs for minor structures such as crib walls are some fraction.
23	Repository Construction	$5.50/cy	$3.30	$0.10	Generally equivalent to EPA's C8a 1,000,000 cy repository but with only a single liner system and cover. DEQ includes a passive treatment to immobilize metals in leachate during dewatering. Hauling material to repository is included in DEQ excavation unit costs. Construction of access road included in DEQ infrastructure allowance.

[a] The State of Idaho was a source of the estimated costs.

Table 8.2-11
Alternative 6 (Mining Companies) TCDs and Estimated Unit Costs

TCD	Description	Direct Capital Unit Cost[a]	Indirect Cost[a]	Annual O&M Cost
PRP01	General Grading	$10,400/acre	$6,250	$100
PRP02	Slope Regrade	$10.30/cy	$6.20	$0.10
PRP03	Toe Pullback at Stream	$210/lf	$130	$2.10
PRP04	Capping	$67,000/acre	$40,000	$680
PRP05	Revegetation	$2,000/ acre	$1,200	$2
PRP06	Material Removal and Disposal at Repository	$18/cy	$10.80	$4.10
PRP07	Stream Cleanout/Disposal at Repository	$89/lf	$53	$20
PRP08	Stream Stabilization	$36/lf	$22	$0.73
PRP09	Adit Source Control	$1,100,000/ea	$660,000	$13,000
PRP10	Adit Discharge Drain Piping	$38/lf	$23	$0.23
PRP11	Block Access	$9,100/ea	$5,500	$130
PRP12	Treatment Wetland Construction	$3,900/gpm	$2,300	$240
PRP13	Riparian enhancement	$5/lf	$3	$0.12
PRP14	Bioengineering BMPs	$42/lf	$25	$1.00
PRP15	Tailings removal	$58/lf	$35	$1.40
PRP16	Streambank actions	$53/lf	$32	$1.30

[a] The mining companies were the source of estimated direct capital costs.

Table 8.2-12
Estimated Results of Alternative Implementation, South Fork at Pinehurst

Alternative	Zinc Concentration as a Multiple of AWQC at Completion of Implementation	Time to Achieve Zinc AWQC Relative to Alternative 4
1	9.8	3.0
2	6.7	2.4
3	3.2	1.5
4	2.3	1.0
5	8.5	2.7
6	8.9	2.8

Graph

9.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

9.1 HUMAN HEALTH ALTERNATIVES

For the human health alternatives, the comparative evaluations are presented in Tables 9.1-1 through 9.1-4, respectively, for soil, drinking water, house dust, and fish consumption alternatives. These tables summarize the various trade-offs between alternatives when compared to screening criteria.

9.2 ECOLOGICAL ALTERNATIVES

Some of the major tradeoffs between the ecological alternatives are related to the key technical issues identified for the site. Discussion of these tradeoffs, in the context of the nine CERCLA evaluation criteria, is included in Tables 9.2-1 (Upper and Lower Basin) and 9.2-2 (Spokane River).

- **Impacted sediments** are believed to be the major source of dissolved metals loading (especially zinc and cadmium) in the Upper Basin, and river bank and bed sediments the major source of metals loading (especially lead) due to erosion in the Lower Basin. 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 to the local communities and natural environment. Much of the sediment is not considered accessible due to its location beneath I-90 and other infrastructure. Other sediment is present beneath private property. Hydraulic isolation is a potential technical solution for dissolved metals loading, but it has potential adverse ecosystem impacts because it may limit the natural interchange of surface water and groundwater. Issues related to impacted sediments are discussed under the Overall Protection of Human Health and the Environment, Long-Term Effectiveness and Permanence, Short-Term Effectiveness, and Implementability criteria.

- **Time to achieve ARARs compliance**, especially AWQC, will be extended 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** for covering, bankfilling, 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 environmental impacts at off-site locations. Availability of materials is discussed under the Implementability criterion.

- **Repository siting**—there are limitations on the availability of suitable sites for large engineered repositories for disposal of excavated or dredged contaminated media. Repository siting is discussed under the Implementability criterion.

- **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 could add to long-term management costs, as would required long-term monitoring and periodic site reviews.

- **Socio-economic impacts**—remedy implementation would have short-term "quality of life" and potential economic impacts related to increased truck traffic, dust and noise generation, potential disruption of services and recreation opportunities, and reduced aesthetic quality. Socio-economic impacts are discussed under the Implementability criterion.

Table 9.1-1
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Recreational Areas					
Overall Protectiveness	No reduction in potential exposure and not protective.	Some reduction in exposure by behavior modification; unlikely to reduce blood lead concentrations to protective levels.	Increased reduction in exposure by restricting access to areas of high concentration; some exposure to other site areas would continue.	High reduction in exposure by restricting access and removing contaminated soil from other site areas; ongoing institutional control program would be needed.	Not applicable for recreational areas.
Compliance with ARARs	No decrease in lead concentrations to meet chemical-specific screening levels for lead and no reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some additional reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.	Not applicable for recreational areas.
Long-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Educational program assumed to continue for 15 years to maintain long-term effectiveness.	Maintenance of barriers assumed to continue for 30 years to maintain long-term effectiveness.	Ongoing maintenance for 30 years assumed necessary for long-term effectiveness because of potential recontamination. Maintenance period could be reduced if upstream sources of contamination are remediated.	Not applicable for recreational areas.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Some effectiveness shortly after program begins; no potential short-term adverse human health effects.	Effective shortly after barrier installation is complete; no potential short-term adverse human health effects.	Effective shortly after completion of soil removal and site improvements; dust suppression methods would need to be implemented during remedial action to minimize exposure to fugitive dust.	Not applicable for recreational areas.
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Easements, rights-of-way, and access agreements might be needed; time would be required to hire a contractor for maintenance and on-call repairs.	Similar requirements as for Alternative S3 plus additional time to establish repositories for contaminated soil and to complete soil removal.	Not applicable for recreational areas.

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Cost for 1,000 ppm Cleanup Level	$0	$243,000	$692,000	$2,018,000	Not applicable for recreational areas.
Residential Yards					
Overall Protectiveness	No reduction in potential exposure and not protective.	Some reduction in exposure by behavior modification; unlikely to reduce blood lead concentrations to protective levels.	Not applicable for residential yards.	Elimination of exposure by partial removal of contaminated soil and installation of barriers; ongoing institutional control program and monitoring would be needed.	Elimination of exposure by complete removal of contaminated soil; ongoing institutional control program would not be needed; monitoring might be needed.
Compliance with ARARs	No decrease in lead concentrations to meet chemical-specific screening levels for lead in residential soils and no reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	Not applicable for residential yards.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead in residential soils; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead in residential soils; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.
Long-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Educational program assumed to continue for 15 years to maintain long-term effectiveness.	Not applicable for residential yards.	Ongoing institutional controls program would continue for 60 years to maintain long-term effectiveness; monitoring would continue for 15 years as part of the educational program.	Institutional controls program would not be needed to maintain long-term effectiveness; monitoring might need to continue for 15 years because of potential for recontamination.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.	No treatment included.

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Residential Yard (Continued)					
Short-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Some effectiveness shortly after program begins; no potential short-term adverse human health effects.	Not applicable for residential yards.	Effective shortly after completion of soil removal and barrier installation; temporary relocation of residents, coordination with house dust remediation, and use of dust suppression methods would be implemented as necessary during remedial action to minimize exposure to fugitive dust.	Effective shortly after completion of soil removal; temporary relocation of residents, coordination with house dust remediation, and use of dust suppression methods would be implemented as necessary during remedial action to minimize exposure to fugitive dust.
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Not applicable for residential yards.	Extensive time would be required to meet with residents and arrange for soil removal, yard restoration, and temporary relocation as needed; ongoing contact would be required for the institutional controls program and monitoring; coordination with the house dust remediation program would be necessary.	Extensive time would be required to meet with residents and arrange for soil removal, yard restoration, and temporary relocation as needed; ongoing contact might be required for monitoring; coordination with the house dust remediation program would be necessary.
Cost for 500 ppm Cleanup Level	$0	$9,340,000	Not applicable for residential yards.	$91,757,000	$140,250,000
Cost for 700 ppm Cleanup Level	$0	$7,375,000	Not applicable for residential yards.	$70,287,000	$107,395,000
Cost for 1,000 ppm Cleanup Level	$0	$5,511,000	Not applicable for residential yards.	$49,928,000	$76,208,000

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Community soils					
Overall Protectiveness	No reduction in potential exposure and not protective.	Some reduction in exposure by behavior modification; unlikely to reduce blood lead concentrations to protective levels.	Increased reduction in exposure by installing fencing to restrict access to areas of high concentration; some exposure to soils in unfenced areas would continue.	High reduction in exposure by restricting access, partially removing contaminated soil, and installing barriers; ongoing institutional control program and monitoring would be needed.	Elimination of exposure by complete removal of contaminated soil; ongoing institutional control program would not be needed; monitoring might be needed.
Compliance with ARARs	No decrease in lead concentrations to meet chemical-specific screening levels for lead and no reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some additional reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead soils; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.
Long-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Educational program assumed to continue for 15 years to maintain long-term effectiveness.	Maintenance of fencing assumed to continue for 30 years to maintain long-term effectiveness.	Ongoing institutional controls program would continue for 60 years to maintain long-term effectiveness; monitoring would continue for 15 years as part of the educational program.	Institutional controls program would not be needed to maintain long-term effectiveness; monitoring might need to continue for 15 years because of potential for recontamination.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Some effectiveness shortly after program begins; no potential short-term adverse human health effects.	Effective shortly after fencing installation is complete; no potential short-term adverse human health effects.	Effective shortly after completion of soil removal and barrier installation; dust suppression methods would need to be implemented during remedial action to minimize exposure to fugitive dust.	Effective shortly after completion of soil removal; dust suppression methods would need to be implemented during remedial action to minimize exposure to fugitive dust.

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Community soils (Continued)					
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Easements, rights-of-way, and access agreements might be needed; time would be required to hire a contractor for maintenance and on-call repairs.	Extensive time would be required to meet with property owners and arrange for soil removal and property restoration; ongoing contact would be needed for the institutional control program and monitoring.	Extensive time would be required to meet with property owners and arrange for soil removal and property restoration; ongoing contact might be needed for monitoring.
Cost for 1,000 ppm Cleanup Level	$0	$312,000	$2,212,000	$35,252,000	$52,437,000

Notes:
For residential properties, Alternatives S2, S4, and S5 include relocation, if necessary.
For recreational areas, Alternative S4 includes access modifications and site improvements, if necessary.
For residential areas, comparative evaluation is for 500, 700, and 1,000 ppm lead cleanup levels; the cleanup level for recreational and other areas is assumed to be 1,000 ppm lead.

Table 9.1-2
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W1 No Action	Alternative W2 Public Information, All Areas	Alternative W3 Residential Treatment, All Areas	Alternative W4 Public Water for Upper Basin (Inside Water District)	Alternative W4 Public Water for Upper Basin (Outside Water District)
Overall Protectiveness	No reduction in potential exposure and not protective.	Not expected to mitigate exposure pathway or reduce contaminant concentrations; unlikely to be protective.	Filters would be protective in areas with lead as the only contaminant; home reverse osmosis (HRO) units would be required to be protective in areas with arsenic or arsenic and lead as the contaminants.	Protective if public water districts comply with state and federal drinking water standards.	Protective if public water districts comply with state and federal drinking water standards.
Compliance with ARARs	No decrease in concentrations to meet MCLs.	No decrease in concentrations to meet MCLs.	Filters would meet MCLs in areas with lead as the only contaminant; HRO units would be required to meet MCLs in areas with arsenic or arsenic and lead as the contaminants.	Minor construction activities could require compliance with some action-specific ARARs; MCLs would be met.	Construction activities would require compliance with several action-specific ARARs; MCLs would be met.
Long-Term Effectiveness	No reduction in exposure to contaminated water and no effectiveness.	No reduction in exposure to contaminated water and no effectiveness; program assumed to continue for 60 years.	Monitoring and maintenance of filters and HRO units would need to continue for 30 years to maintain long-term effectiveness.	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No reduction of toxicity or volume; reduction in mobility using filtration/HRO units.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated water and no effectiveness.	No reduction in exposure to contaminated water and no effectiveness.	Effective shortly after filter/HRO unit installation is complete; no potential short-term adverse human health effects.	Additional connections could be provided rapidly if there is system capacity; effective shortly after completion of additional connections.	Distribution system study, and planning would delay implementation; effective shortly after completion of construction.
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Some time would be required to meet with residents and arrange for installation, maintenance, and monitoring of filters/HRO units.	Systems would need to be reviewed to determine if there is capacity for additional connections.	Considerable time would be required to study, plan, design, and construct new systems; multiple pumping stations would be needed to provide systems in gulches.
Cost	$0	$428,000	$1,418,000	$129,000	$7,208,000

Table 9.1-2 (Continued)
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W4 Public Water for Lower Basin & Kingston (Inside Water District)	Alternative W4 Public Water for Lower Basin & Kingston (Outside Water District)	Alternative W5 Groundwater for Upper Basin (Inside Water District)	Alternative W5 Groundwater for Upper Basin (Outside Water District)
Overall Protectiveness	Protective if public water districts comply with state and federal drinking water standards.	Protective if public water districts comply with state and federal drinking water standards.	Protective in areas where suitable aquifers exist..	Protective in areas where suitable aquifers exist..
Compliance with ARARs	Minor construction activities could require compliance with some action-specific ARARs; MCLs would be met.	Construction activities would require compliance with several action-specific ARARs; MCLs would be met.	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.
Long-Term Effectiveness	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	Additional connections could be provided rapidly if there is system capacity; effective shortly after completion of additional connections.	Distribution system study, and planning would delay implementation; effective shortly after completion of construction.	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.
Implementability	Systems would need to be reviewed to determine if there is capacity for additional connections.	Considerable time would be required to study, plan, design, and construct new systems; lengthy rural water mains could be required.	Difficult to implement in many areas of the Upper Basin because of a lack of suitable aquifers and because some areas have moratoriums on construction of new wells.	Difficult to implement in many areas of the Upper Basin because of a lack of suitable aquifers and because some areas have moratoriums on construction of new wells.
Cost	$688,000	$2,821,000	$152,000	$268,000

Table 9.1-2 (Continued)
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W5 Groundwater for Lower Basin and Kingston (Inside Water District)	Alternative W5 Groundwater for Lower Basin and Kingston (Outside Water District)	Alternative W6 Multiple Alternative Sources
Overall Protectiveness	Protective in areas where suitable aquifers exist..	Protective in areas where suitable aquifers exist..	In the Upper Basin, filters would provide protection if lead is the only contaminant; HRO units would be needed if arsenic or arsenic and lead are contaminants; connections to water districts would be protective if water districts comply with federal and state drinking water standards. In the Lower Basin, protection would be provided by installation of wells in suitable aquifers or by connection to water districts that comply with federal and state drinking water standards.
Compliance with ARARs	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.	Minor construction activities could require compliance with some action-specific ARARs; MCLs would be met.
Long-Term Effectiveness	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.	In the Upper Basin, long-term effectiveness would depend on monitoring and maintenance of filters and HRO units and on the reliability of public water districts for new connections. In the Lower Basin, long-term effectiveness of new wells could vary depending on subsurface conditions; monitoring of new wells would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; long-term effectiveness of new connections to water systems would be dependent on the reliability of public water systems. Monitoring and maintenance assumed to continue for 30 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No reduction of toxicity or volume; reduction in mobility using filters and HRO units.
Short-Term Effectiveness	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.	For the Upper Basin, effective shortly after filters and HRO units are installed and after new connections to public water supplies are completed. For the Lower Basin, effective shortly after new wells become operational and after new connections to public water supplies are completed; providing interim bottled water could further increase short-term effectiveness while waiting for well installation. No potential short-term adverse human health effects.

Table 9.1-2 (Continued)
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W5 Groundwater for Lower Basin and Kingston (Inside Water District)	Alternative W5 Groundwater for Lower Basin and Kingston (Outside Water District)	Alternative W6 Multiple Alternative Sources
Implementability	Difficult to implement in some areas of the Lower Basin because of a lack of suitable aquifers.	Difficult to implement in some areas of the Lower Basin because of a lack of suitable aquifers.	For the Upper Basin, some time would be required to meet with residents and arrange for installation, maintenance, and monitoring of filters/HRO units; water supply systems would need to be reviewed to determine if there is capacity for additional connections. For the Lower Basin, new wells might be difficult to implement in some areas because of a lack of suitable aquifers; water supply systems would need to be reviewed to determine if there is capacity for additional connections.
Cost	$1,245,000	$1,245,000	$2,210,000

Table 9.1-3
Comparative Evaluation of Human Health Alternatives for House Dust

Criteria	Alternative D1 No Action	Alternative D2 Information and Intervention and Vacuum Loan/Dust Mats	Alternative D3 Information and Intervention, Vacuum Loan/Dust Mats, Inferior Source Removal, and Capping/More Extensive Cleaning
Overall Protectiveness	No reduction in potential exposure and not protective.	Would reduce exposure and protect human health through education, awareness, and the availability of vacuums to remove contaminated house dust; degree of protectiveness dependent on efforts of individual counselors or nurses and the receptiveness of residents.	Would reduce exposure and protect human health by removing contaminated house dust from residences and by minimizing recontamination through education, awareness, and the use of loaned vacuums; degree of continued protectiveness dependent on efforts of individual counselors or nurses and the receptiveness of residents.
Compliance with ARARs	No decrease in concentrations to meet state or federal air quality standards.	Use of HEPA filters on vacuums and air monitoring should result in compliance with state and federal air quality standards.	Removing dust from homes followed by ongoing use of HEPA filters on vacuums and air monitoring should result in compliance with state and federal air quality standards; minor construction activities and disposal of some home furnishings will require compliance with some location-specific and action-specific ARARs.
Long-Term Effectiveness	No reduction in exposure to contaminated house dust and no effectiveness.	Long-term effectiveness will depend on residents participation in the vacuum loan and educational programs and on the quality and frequency of counseling and educational information provided; the program would continue for a period of 15 years.	Long-term effectiveness will be enhanced by cleaning interiors of residences after exterior cleanup is completed; long-term effectiveness will also depend on residents ongoing participation in the vacuum loan and educational programs and on the quality and frequency of counseling and educational information provided; cleaning of attics and basements and addition of caps to crawl spaces will increase long-term effectiveness by reducing exposure while these areas are being used by residents and reduce potential for these areas to be an additional source of contaminated house dust; ongoing monitoring and maintenance will be needed; the program would continue for a period of 15 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated house dust and no effectiveness.	Effective in reducing dust concentrations in residences shortly after implementation; effectiveness in reducing blood lead levels could take several years; there would be no potential for short-term adverse human health effects.	Effective in reducing dust concentrations in residences shortly after implementation; effectiveness in reducing blood lead levels could take several years; workers would need to comply with standard safety procedures to minimize the potential for short-term adverse human health effects during interior cleaning, disposal of home furnishings, and capping of crawl spaces.
Implementability	Easily implemented; no action required.	Some time would be required to fund, hire staff, and purchase equipment for this program.	Some time would be required to fund, hire staff, and purchase equipment for the educational and vacuum loan/dust mat program; additional time would be required to hire and train qualified contractors for interior residential cleaning and other remedial activities.
Cost	$0	$1,390,000	$4,140,000

Table 9.1-4
Comparative Evaluation of Human Health Alternatives for Fish Consumption

Criteria	Alternative F1 No Action	Alternative F2 Information and Intervention	Alternative F3 Information and Intervention and Monitoring
Overall Protectiveness	No reduction in potential exposure and not protective.	Would reduce exposure and protect human health through education and awareness.	Would reduce exposure and protect human health through education and awareness; monitoring would provide location-specific information for the public.
Compliance with ARARs	There are no ARARs that specifically address the consumption of fish; no related ARARs would be considered.	There are no ARARs that specifically address the consumption of fish; federal and state surface water quality standards established to protect aquatic life would be considered to provide long-term protectiveness of fisheries resources in the Basin.	There are no ARARs that specifically address the consumption of fish; federal and state surface water quality standards established to protect aquatic life would be considered to provide long-term protectiveness of fisheries resources in the Basin.
Long-Term Effectiveness	No reduction in exposure from consumption of fish and no effectiveness.	Long-term effectiveness will depend on residents participation in educational programs and on the quality and frequency of educational information provided; the program would continue for a period of 15 years.	Long-term effectiveness will depend on residents participation in educational programs and on the quality and frequency of educational information provided; monitoring would permit focusing of the educational programs and provide a greater degree of long-term protectiveness; the program would continue for a period of 15 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure from consumption of fish and no effectiveness.	Effective in reducing contaminated fish consumption shortly after implementation; there would be no potential for short-term adverse human health effects.	Effective in reducing contaminated fish consumption shortly after implementation; some time would be required for the results of monitoring to improve the effectiveness of the educational programs; there would be no potential for short-term adverse human health effects.
Implementability	Easily implemented; no action required.	Some components of this alternative have already been implemented in the Basin; some time would be required to fund and hire staff to expand this program.	Some components of the educational programs have already been implemented in the Basin; some time would be required to fund and hire staff to expand the educational program; additional time would be required to fund, plan, and implement a monitoring program..
Cost	$0	$230,000	$929,000

Table 9.2-1
Comparison of Ecological Alternatives Developed for the Upper and Lower Basins Using CERCLA Criteria

Criterion	Alternative 1 No Action	Alternative 2 Combined Stabilization/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	Not protective	Intermediate level of long-term effectiveness and time to achieve RAOs, including ARARs. Significant potential short-term impacts and implementability problems.	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.	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.	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.	Least protective of action alternatives.
Compliance with ARARs	Would not comply with ARARs within a reasonable timeframe	Intermediate time to achieve ARARs compliance. Estimated time to achieve compliance 140% longer than Alternative 4.	Second shortest time to achieve ARARs compliance. Estimated time to achieve compliance 50% longer than Alternative 4.	Shortest time to achieve ARARs compliance.	Second longest time to achieve ARARs compliance. Estimated time to achieve compliance 170% longer than Alternative 4.	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	Residual risk includes moderate potential for future erosion of impacted bed and bank sediments in Lower Basin. Continued loading from inaccessible sediments in Upper Basin. Estimated reduction of dissolved metals load in Upper Basin of 30%. Passive water treatment used, which is less reliable than active treatment. Effectiveness of soil treatment in Lower Basin is uncertain.	Residual risk includes limited potential for future erosion of impacted bed and bank sediments in Lower Basin. Estimated reduction of dissolved metals load in Upper Basin of 64%. Hydraulic isolation used to limit loading from inaccessible sediments in Upper Basin. Active water treatment used, which is more reliable than passive treatment. Relatively low potential for recontamination. Hydraulic isolation could have adverse ecosystem impacts.	Similar to Alternative 3, with some increase in effectiveness and permanence as a result of more widespread use of removal and disposal. Estimated reduction of dissolved metals load in Upper Basin of 73%.	Residual risks result from limited removal of bank wedges in Lower Basin, which could be remobilized by flooding or channel migration. Limited actions to address sediments and associated dissolved metals loads in Upper Basin. Estimated reduction of dissolved metals load in Upper Basin of 13%. Passive water treatment used, which is less reliable than active treatment. Effectiveness of soil treatment in Lower Basin is uncertain.	Highest residual risks among action alternatives, including least removal of bank wedges in Lower Basin, which could be remobilized by flooding or channel migration. Fewest actions to address sediments in Upper Basin. Estimated reduction of dissolved metals load in Upper Basin of 9%. Relies primarily on institutional controls to reduce waterfowl exposure to metals, and effectiveness is uncertain. Uses passive water treatment, which is less reliable than active treatment.
Reduction of Toxicity, Mobility, or Volume through Treatment		Substantial reduction of toxicity of drainage from major adits using passive treatment; no groundwater treatment	Reduction of toxicity using active treatment of groundwater and adits that are major loaders	Maximum reduction of water toxicity through treatment	Substantial reduction of toxicity of drainage from major adits using passive treatment; no groundwater treatment	Least reduction of toxicity through treatment.
Short-Term Effectiveness		Intermediate level of potential short-term water quality impacts. Moderate potential for short-term habitat loss. Intermediate implementation timeframe. Significant potential risks to community from increased truck traffic and dust generated by remedial activities. Intermediate level of overall short-term reduction of risk to ecological receptors.	Substantial potential for short-term water quality impacts, especially from riverbed dredging. Substantial potential for short-term loss of habitat in Lower Basin wetlands. High level of overall reduction of risk, but achieved only after a relatively long implementation period. Significant potential risks to community from increased truck traffic and dust generated by remedial activities.	Greatest potential for short-term water quality impacts, especially from riverbed dredging. Greatest potential for short-term loss of habitat resulting from widespread excavation of sediment in Lower Basin wetlands and floodplains. Highest level of overall reduction of risk, but achieved only after longest implementation period. Greatest potential risks to community from increased truck traffic and dust generated by remedial activities.	Relatively little potential for short-term water quality impacts. Moderate potential for short-term habitat loss. Relatively short implementation period. Relatively small risks to the community from remedy implementation. Intermediate level of overall short-term reduction of risk to ecological receptors.	Relatively little potential for short-term water quality impacts or habitat loss. Relatively short implementation period. Relatively small risks to the community from remedy implementation. Least overall short-term reduction of risk to ecological receptors.
Implementability		Potential concerns with availability of topsoil (or other growth media) and clean fill needed for revegetation of removal areas and repositories. Siting/permitting of repositories with 2.5 million cy capacity may be feasible. Potential problems with feasibility of sediment removals.	Limited availability of topsoil (or other growth media) and clean fill needed for revegetation of removal areas and repositories. Substantial siting/permitting problems associated with 26 million cy of repository capacity. Potential problems with feasibility of sediment removals and hydraulic isolation.	Greatest implementability problems related to availability of materials, technical feasibility, and siting/permitting of repositories with 67 million cy of capacity.	Relatively small materials requirements, siting/permitting of repositories with 1.4 million cy capacity should be feasible.	Least materials requirements, siting/permitting of repositories with 260,000 cy capacity should be feasible.
Cost		Total present worth cost = $370,000,000 Present worth O&M cost = $44,000,000	Total present worth cost = $1,300,000,000 Present worth O&M cost = $146,000,000	Total present worth cost = $2,500,000,000 Present worth O&M cost = $190,000,000	Total present worth cost = $257,000,000 Present worth O&M cost = $25,000,000	Total present worth cost = $194,000,000 Present worth O&M cost = $21,000,000
State Acceptance	To be completed following receipt of state comments on FS					
Community Acceptance	To be completed following receipt of public comments on FS					

Table 9.2-2
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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					
Controls used to reduce risks	No actions to reduce risk. Existing unacceptable risks to ecological receptors would remain unabated. Potential human health risks would remain unchanged.	Institutional controls would be used to limit potential human exposure and to control activities that may increase erosion of contaminants. Activities include postings, advisories, and vehicular access restrictions. Unacceptable risks to ecological receptors would continue for the foreseeable future. Human health risks may be reduced if individuals modify their behavior.	Limited removals and capping and containment would be used to reduce risks to human health. The actions taken to reduce risks to human health would significantly reduce ecological risks, as well. Beach material posing potential human health risks would be left in place and covered with a clean layer of imported beach material. In locations where riverine or riparian habitat may be adversely impacted by the grade changes created by a cover, beach materials would be excavated and backfilled with clean materials.	Excavation and disposal of beach and bank materials would be used to reduce potential human health and ecological risks. Only sediments posing potential human health risks and/or posing significant ecological risks that are located in critical habitat areas would be excavated and disposed of in a RCRA Subtitle D landfill. Capping of in-stream sediments exceeding PRGs would be used to minimize direct ecological exposure.	Extensive excavation of beach, bank, and in-stream sediments would be used to eliminate risks to human and most ecological receptors. Areas outside of critical habitat areas where sediment contaminant concentrations exceed PRGs would also be excavated. All materials would be disposed of in a RCRA Subtitle D landfill.
Effectiveness summary	Would not effectively reduce risks. Natural recovery processes may provide some limited long-term reduction in risk.	May be ineffective in reducing risks to humans. Calculated human health risks would remain the same. Would provide very limited reductions in the risk to ecological receptors by reducing erosion of contaminants. Natural recovery processes may provide some limited long-term reduction in risk.	Would effectively contain sediments posing risks to human health, and would effectively contain some but not all sediments posing risks to ecological receptors. Natural recovery processes may provide some additional long-term reduction in risk.	Removal and disposal of beach sediments would effectively reduce risks to human health and to ecological receptors in critical habitat areas. Capping would be effective in reducing ecological risks from in-stream sediments. Natural recovery processes may provide some additional long-term reduction in risk.	Removal and disposal would permanently remove all sediments posing significant human health and ecological risks. Natural recovery processes may further reduce residual risk
ARARs summary	Sediment ARARs would not be met for the foreseeable future.	Sediment ARARs would not be met for the foreseeable future.	Sediment ARARs would be met.	Sediment ARARs would be met.	Sediment ARARs would be met.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Compliance with ARARs					
Chemical-specific ARARs	Would not comply with chemical-specific ARARs for sediments, including the Washington State MTCA Method B values for the metals of concern.	See Alternative 1.	Would comply with chemical-specific ARARs for sediments, including the Washington State MTCA Method B values for the metals of concern.	See Alternative 3.	See Alternative 3.
Location-and action-specific ARARs	Not Applicable.	Not Applicable.	Would comply with all action-specific and location-specific ARARs, including substantive requirements of the Endangered Species Act, the Rivers and Harbors Act, Executive Order 11988 concerning work within a floodplain, the Washington State Shoreline Management Act, and the Washington State Hydraulic Projects Approval.	Would comply with all action-specific and location-specific ARARs, including substantive requirements of the Endangered Species Act, CWA §404 dredge and fill requirements, the Rivers and Harbors Act, Executive Order 11988 concerning work within a floodplain, the Washington State Shoreline Management Act, and the Washington State Hydraulic Projects Approval.	See Alternative 4.
Long-Term Effectiveness and Permanence					
Magnitude of residual risk	Magnitude of existing ecological risk and human health risk may decrease slightly due to natural recovery or remain essentially unchanged for several decades or longer.	High residual risk to ecological receptors. Some slight reductions would occur due to reductions in the erosion of contaminated sediments and through natural recovery. Potentially significant residual risk to human receptors. Postings, advisories, and vehicular access restrictions would have limited effectiveness.	Moderate residual risks to ecological receptors. Some contaminated sediments in critical habitat areas would not be remediated, and would pose a risk to ecological receptors. Natural recovery processes may further reduce residual risks in unremediated areas. Low residual risks to humans. Containment of contaminated sediments in excess of human health PRGs would be effective.	Low residual risks to ecological receptors. All contaminated sediments in critical habitat areas would be remediated, and would no longer pose a threat to ecological receptors. Natural recovery processes may further reduce residual risks in unremediated areas. Low residual risks to humans.	Very low residual risks to ecological receptors. All contaminated sediments above PRGs would be remediated, except for in-stream sediments in free-flowing portions of the upper Spokane River. Very low residual risks to humans.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Long-Term Effectiveness and Permanence (Continued)					
Adequacy and reliability of controls	No controls would be placed to control residual risks.	Remedy could effectively be maintained through inspections and replacement of damaged signs or vehicle barriers. Minimal maintenance requirements for the institutional controls.	Remedy could effectively be maintained through monitoring, maintenance, and institutional controls. Moderate maintenance requirements for caps and vegetated bank stabilization. Potential need for additional actions in the future due to recontamination of remediated areas as a result of transport of contaminants from upstream source areas.	Remedy could effectively be maintained through monitoring, maintenance, and institutional controls. Moderate maintenance requirements for in-stream cap. Potential need for additional actions in the future due to recontamination of remediated areas as a result of transport of contaminants from upstream source areas.	No long-term maintenance requirements, because contaminated sediments removed from site. Potential need for additional actions in the future due to recontamination of remediated areas as a result of transport of contaminants from upstream source areas.
Reduction of Toxicity, Mobility, or Volume through Treatment					
Treatment processes used	None.	None.	None.	None.	None.
Amount treated or destroyed	None.	None.	None.	None.	None.
Reduction in toxicity, mobility, or volume	None.	None.	None.	None.	None.
Irreversible treatment	None.	None.	None.	None.	None.
Type and quantity of residuals	None.	None.	None.	None.	None.
Statutory preference for treatment	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Short-Term Effectiveness					
Community protection	No additional short-term risks to community	No additional short-term risks to community	Limited short-term risks to community from construction traffic (2,000 truck trips). Risks minimized by traffic control plans.	Limited short-term risks to community from construction traffic (14,00 truck trips). Risks minimized by traffic control plans.	Limited short-term risks to community from construction traffic (44,000 truck trips). Risks minimized by traffic control plans.
Worker protection	No additional short-term risks to workers	No significant short-term risks to the workers due to the very limited construction activities.	Limited risks to workers from remediation actions. Risk would be minimized with standard health and safety measures.	Limited risks to workers from remediation actions. Risk would be minimized with standard health and safety measures. Significantly greater scope of actions would increase overall risk of worker injury.	Limited risks to workers from remediation actions. Risk would be minimized with standard health and safety measures. Greatest scope of actions would increase overall risk of worker injury.
Environmental impacts	No additional short-term risks to environment	No significant short-term risks to the environment due to the very limited construction activities.	Limited short-term impacts to the environment due to construction within the floodplain and riparian areas. These impacts are associated with: • Vegetated bank stabilization of 400 linear feet of embankment • Capping or excavating of 6.1 acres in the floodplain. Impacts will include an increase in sediment loads to the river during construction. These loads would be minimized or controlled through engineering controls.	Significant short-term impacts to the environment due to construction within the floodplain/ riparian areas and the Spokane River. These impacts are associated with: • Excavating 8.6 acres in the floodplain • Capping of in-stream sediments. Impacts will include an increase in sediment loads to the river during the excavation of floodplain/riparian areas, and re-mobilization of contaminated sediments during in-stream cap placement. These loads would be minimized or controlled through engineering controls.	Significant short-term impacts to the environment due to construction within the floodplain/ riparian areas and the Spokane River. These impacts are associated with: • Excavating 110 acres in the floodplain • Dredging and dewatering in-stream sediments. Impacts will include an increase in sediment loads to the river during the excavation of floodplain/riparian areas, re-mobilization of contaminated sediments during dredging, and water quality impacts due to discharge of water from the dewatering process. These impacts would be minimized or controlled through engineering controls and potentially water treatment.
Time until action is complete	Ineffective in reducing risks in the short-term. RAOs would not be achieved for the foreseeable future.	Would take approximately 1 month to implement. RAOs would not be achieved for the foreseeable future.	Would take approximately 6 months to implement. As construction is completed at individual sites, RAOs for sediments could be achieved immediately for these sites. RAOs would not be achieved in areas not being remediated for many years or decades.	Would take approximately 1 to 2 years to implement. As construction is completed at individual sites, RAOs for sediments could be achieved immediately for these sites. RAOs would not be achieved in areas not being remediated for many years or decades.	Would take approximately 2 to 3 years to implement and achieve RAOs.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Implementability					
Technical feasibility	Not applicable.	Technically feasible. No difficulties are anticipated during implementation of this alternative. Monitoring the effectiveness of this alternative in reducing exposures may be difficult.	Technically feasible. The primary difficulty associated with this alternative is access to the riverbanks. Monitoring can effectively measure the success of achieving RAOs.	Technically feasible. Some uncertainties in construction volumes. The primary difficulty associated with this alternative is access to the riverbanks and availability of staging areas for remediation of in-stream sediments. Monitoring can effectively measure the success of achieving RAOs.	Technically feasible. Significant uncertainties in construction volumes. Access to the riverbanks and availability of staging areas for remediation of in-stream sediments may be major concerns and could potentially increase costs. Monitoring can effectively measure the success of achieving RAOs.
Administrative feasibility	No significant administrative feasibility concerns.	No significant administrative feasibility concerns.	No significant administrative feasibility concerns. Coordination with other agencies required, potentially including completion of a biological assessment.	No significant administrative feasibility concerns. Coordination with other agencies required, potentially including completion of a biological assessment.	No significant administrative feasibility concerns. Coordination with other agencies required, potentially including completion of a biological assessment.
Availability of services and materials	Not applicable.	Not applicable.	Services, equipment, and technologies are all readily available.	Services, equipment, and technologies are all readily available.	Services, equipment, and technologies are all readily available. Potentially limited capacity at local landfill may necessitate longer transport distances.
Costs					
Capital	$0	$6,400	$920,000	$5,200,000	$26,000,000
30-Year O&M [a]	$0	$420,000	$460,000	$840,000	$820,000
Total present worth[b]	$0	$430,000	$1,400,000	$6,000,000	$27,000,000

[a]Operation and maintenance costs over 30 years in current dollars, assuming a 7% discount factor

[b]Total present worth cost equals the total equivalent cost of the alternative over 30 years in current dollars, assuming a 7% discount factor.

Notes:

ARARs - applicable or relevant and appropriate requirements
CY - cubic yards
LF - linear feet
RAO - remedial action objectives

10.0 PREFERRED ALTERNATIVE

The preferred alternative, based on cost effectiveness, is Alternative 3 for the Upper Basin and Lower Basin, Alternative 2 for Coeur d'Alene Lake, and Alternative 4 for the Spokane River. However, as stated previously, EPA is working in cooperation with the governments (including the states of Idaho and Washington and the Coeur d'Alene and Spokane Tribes) to develop a phased preferred alternative to cleanup contamination in the Basin.

For protection of human health, a wealth of information from the implementation of the remedy in the Bunker Hill Box was used when evaluating the range of cleanup alternatives. Based on this evaluation, the governments have general agreement on the proposed remedy for protection of human health in the communities of the Upper Basin, which includes areas upstream of the confluence of the North and South Forks of the Coeur d'Alene River. The governments are continuing discussions to identify appropriate solutions to resolve human health issues in the Lower Basin.

Given the size of Operable Unit 4, it is difficult to support a short-duration comprehensive remedy for the protection of ecological life in the Basin. In preparing the ecological Feasibility Study (FS) alternatives, EPA assembled and evaluated a range of comprehensive alternatives designed to achieve compliance with regulations and long-term protection of the environment to the extent possible. Also, as the alternatives included assumptions of source contribution and effectiveness of remedial actions for areas that are not yet well understood in the Basin, a phased approach would allow for a learn-as-you-go or "adaptive management" approach to Basin remediation, which should result in significant efficiencies over time.

10.1 HUMAN HEALTH PROTECTION

The preferred alternative for protection of human health is summarized in Table 10.1-1.

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 Basin. Potential lesser exposures are from lead in fish from the Lower Lakes and arsenic in shallow drinking water wells in the side gulches of the Upper Basin.

The risk assessment also identified potential 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 water potatoes and other cultural

plants throughout the wetlands, and eating large amounts of fish. The State of Washington is very concerned about the risks that exist to recreational users along the Spokane River. These exposures include contaminated beaches and fish consumption. Exposures at developed recreation areas in the Coeur d'Alene River Basin are addressed in the human health alternatives discussed in this section. Exposures at undeveloped recreation areas in the Coeur d'Alene River Basin and along the Spokane River are addressed as part of the ecological alternatives, which are described in Section 10.2.

10.1.1 Soil, House Dust, and Intervention Programs

The ultimate remedy for childhood exposure to lead is prevention. The importance of prevention of lead exposure has been highlighted by recent studies indicating adverse health effects at blood lead levels below 10 µg/dL and the failure of chelation treatment to prevent cognitive impairments in treated children (Lanphear et al. 2000; Rogan et al. 2001; Rosen and Mushak 2001). Actions include source removal and containment as well as public information and intervention. The proposed soil cleanup level is 1000 ppm lead for removal and capping of residential yards and common use areas. Soil with lead concentrations between 700 ppm and 1000 ppm would require a barrier such as vegetation, to prevent exposure and distribution of dust. Yard soil with lead concentrations greater than 1000 ppm will be removed to a depth of one foot (two feet in garden areas) and backfilled with clean soils and/or capped.

For those commercial properties within the site where access cannot be controlled, soil will be removed and replaced if soil concentrations exceed 1000 ppm lead, unless access and recontamination pathways can be otherwise controlled. This is necessary due to the linkage between community wide dust concentrations from all properties and recontamination, as well as childhood blood lead levels (HHRA, 2001, Five Year Review, 2000). Geographically, the valley is quite narrow in most places and this is likely the reason that young children often have limited places to play, and when not at their home are often found on commercial properties, providing direct exposure routes. Also, it has been shown that levels of community wide dust are correlated with individual house dust levels, which is likely why blood leads have been found to drop as community wide (not just on residential properties) levels of lead in dust falls over time.

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 with a foot of clean soil. Excavation of soils in recreational areas may also be used, as appropriate. The State of Washington firmly believes the preferred alternative should include the cleanup of Spokane River beach areas. Suitable barriers to exposure of lead contaminated soil and dust in common use areas such as streets, alleys, rights-of-ways, mine and mill sites, and playgrounds include removal, capping and vegetation.

It is expected that removal of one foot of contaminated soil and replacement with clean soil would go a long way to reducing lead concentrations inside each home, in addition to regular

cleaning and carpet replacement (disposal of carpets would be assisted by an institutional controls program, much like that in the smelter area). Young children are primarily exposed to lead in dust on the floors of their home (Manton et al. 2000; Succop et al. 1998; CDC 1991; Lanphear et al. 1998). Lead in house dust reflects contaminated soil from the yard, neighborhood and surrounding community (TerraGraphics 1999). Contaminated yard soil removal has been shown to be effective in reducing house dust concentrations in the smelter area for a large number of homes; this house dust concentration reduction co-occurred with a substantial drop in blood lead levels in children (Populated Areas Five Year Review, EPA, 2000). For the limited number of homes which continue to have a reservoir of high concentration of lead dust, a contingency is necessary (FS option D3 which includes cleaning, if necessary) to allow for assessment of these homes to determine if additional action is necessary should lead loading rates and/or concentrations exceed the prescribed criteria. The assessment would determine if rigorous cleaning of the home is necessary, if paint abatement of the home is necessary (to be conducted by a separate state run abatement program), or if both are necessary, with paint abatement preceding house cleaning to minimize recontamination. Costs of abatement of these homes are based on the Smelterville house cleaning pilot study (Terragraphics 2001) and are expected to decrease, should a lower level of cleaning considered in the study prove to be effective, and also by virtue of the economy of scale of cleaning a larger number of homes that were dealt with in the pilot.

Relocation is proposed as a last resort for homes which have contamination above action levels, but which have extensive recontamination potential, or for which adequate cleanup will be extremely difficult. An example where this may be applied is for homes in Cataldo within the floodplain where an existing relocation effort is underway. For the vast majority of homes which fall above the action level, every effort will be made to find a way in which the preferred soil alternative is effective in the long term.

In the interim before sources of lead exposure are adequately controlled, 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 will be available.

10.1.2 Drinking Water

To reduce current exposure from metals in drinking water, an alternative water supply would be provided to residences or areas where the existing water supply contains metals at concentrations greater than the maximum contaminant levels (MCLs). Residences with affected private wells within water districts would be connected to the existing public water supply system. For residences outside water districts (mostly in the tributary gulches), the alternative water supply would most likely consist of point-of-use treatment or new groundwater wells installed into a

suitable aquifer. A preferred alternative for protection of potential future drinking water supplies is not addressed at this time due to limitations in the RI.

10.1.3 Fish Consumption

The potential for lead exposure through fish consumption would be managed through educational resources available to fishermen and other recreational users about the potential health risk of consuming contaminated fish caught from lateral lakes and health advisories for subsistence fishing. A fish consumption advisory already exists in the Lower Basin and along part of the Spokane River. Decreases 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.

10.2 ECOLOGICAL PROTECTION

The preferred alternative for ecological protection in the Upper Basin and Lower Basin is Alternative 3. Three priority issues have been identified as an initial primary focus with respect to ecological protection.

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams.** These metals have harmful effects on aquatic receptors, including fish. Approximately 20 miles of the South Fork and 10 miles of tributaries are unable to sustain reproducing fish populations. Species density and diversity are reduced throughout the Basin, and 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 ESA. The ambient water quality criteria for zinc and cadmium are exceeded throughout the Coeur d'Alene River system downstream of mining impacts, in Coeur d'Alene Lake, and in the Spokane River.

- **Lead in wetlands and floodplains.** Existing lead contamination has harmful effects on waterfowl and plants. Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. The total number of waterfowl dying of lead poisoning has not been estimated, however, 682 dead or sick birds were found in the Basin between 1992 and 1997. The number of waterfowl carcasses found in 1997 represented the largest documented die-off in the Coeur d'Alene River Basin since 1953. 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 at reference sites nationally.

- **Particulate lead in the surface water**. Lead transported downstream in the river system is a continuing source of contamination to 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 warning 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 habitat areas cleaned up as part of the remedy.

In addition to ecological protection, the actions described in the following sections would have significant human health benefits for sensitive populations, including children. 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.

Sensitive populations potentially include low-income families, whose options for recreation, diet, and housing may be limited, or families who recreate frequently on the river by choice. These sensitive populations may have relatively high cumulative exposures to metals, particularly lead, compared to other population groups. These higher metals exposures may result from relatively high use of streambanks and beaches for recreation, fishing for recreation and diet, homegrown and wild vegetables for diet, and lead in house paint and water piping. For these sensitive populations, the reduction of incremental risk achieved by remediating contaminated streambank and beach sediments at recreation areas could have important health benefits.

Sensitive populations could also include individuals who would choose to practice a subsistence lifestyle. Currently, tribal member and others cannot safely practice a subsistence lifestyle due to the presence of contamination. Individuals practicing a subsistence lifestyle would consume much larger quantities of food derived from the Basin and potentially impacted by metals, including fish and water potatoes. The estimated consumption rates of fish and water potatoes by adults practicing a traditional subsistence lifestyle are 540 grams per day and 574 grams per day, respectively[4]. The water potato, a critical tribal resource, grows in submerged sediments, therefore, harvested water potato may have significant quantities of attached sediment, which could subsequently be ingested. In addition, a subsistence lifestyle would potentially include ingestion of untreated surface water.

[4] Subsistence lifestyles typically include ingestion of whole fish, including organs and bones that typically contain higher levels of metals than muscle tissue (filets).

10.2.1 Dissolved Metals in Rivers and Streams

High levels of dissolved metals, particularly zinc and cadmium, exist in the river system in the Basin. The dissolved metals concentrations and impacts from mining currently prevent the river system from fully supporting aquatic receptors, including native fish. The widespread occurrence of the tailings-impacted sediments, however, will make it difficult to reduce dissolved metals throughout the entire Basin to concentrations that fully support some sensitive native fish species in any reasonably short timeframe. It is not expected that this could be achieved throughout the Basin within a single lifetime using a practical cleanup scenario. However, further improvements to the ecosystem can begin in the short term and continue for many decades by combining remedial actions with natural recovery. In addition, some portions of the impacted areas can likely be returned to levels that will greatly improve the ecosystem locally.

In the shorter term, it is possible to achieve reductions of dissolved metals to concentrations that allow substantial improvement to the fisheries in selected stream segments and to the ecosystem of the upstream reaches of the South Fork and some of its tributaries. Fish and aquatic organisms that are more tolerant of metals than the 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.

Priority areas for the initial phase of remedy implementation will be selected based upon public input. However, those reaches where the most load reduction can be practically achieved and where the best chances exist for re-establishing a sustainable trout fishery, would be of particular interest. Table 10.2-1 identifies candidate interim benchmarks and associated costs for reducing dissolved metals in streams and improving fisheries in upstream areas of the Upper Basin.

One candidate interim benchmark for Ninemile Creek could be to provide conditions that would allow natural re-establishment of an adult fishery. An adult fishery would not necessarily include the presence of metals-sensitive species, reproduction, or juveniles. It is expected that an extended period of natural recovery would be needed to achieve conditions compatible with a fully-functional fishery in Ninemile Creek. The metals concentrations compatible with an adult fishery are under evaluation. Preliminary evaluations of reference areas where adult trout fisheries exist suggest that zinc concentrations would need to be reduced to about 4 to 7 times the AWQC. Currently, Ninemile Creek is essentially devoid of fish downstream of the area of mining impacts. Based on current concentrations of metals in Ninemile Creek and the expected reductions in metals loading that would result from remedial actions, it is anticipated that a relatively comprehensive level of cleanup would be required to achieve metals concentrations compatible with an adult fishery in Ninemile Creek. While return of an adult fishery is a candidate interim benchmark for Ninemile Creek, the remediation goals for Ninemile Creek are the RAOs listed in Table 7.2-1.

One candidate interim benchmark for Pine Creek could be to provide conditions that would allow natural re-establishment of a fully functional trout fishery. The parameters that define a fully functional fishery include total population, species diversity (including the presence of relatively metals-sensitive native species), and reproduction. The metals concentrations compatible with a fully functional fishery are expected to be approximately equal to the AWQC. Currently, Pine Creek supports an adult fishery downstream of the area of area of mining impacts, including brook trout and cutthroat trout. Based on current concentrations of metals in Pine Creek and the expected reductions in metals loading that would result from remedial actions, it is anticipated that a relatively comprehensive level of cleanup would be required to achieve metals concentrations compatible with a fully functional fishery in Pine Creek.

The overall effects of implementing the first increment of the remedy on metals loads in the river system are shown in Table 10.2-2. For an increment that includes comprehensive cleanup of Pine Creek and Ninemile Creek and implementation of upgraded water treatment of the Bunker Hill mine water, reductions of zinc loads of about 15 percent in the South Fork at Pinehurst and 12 percent in the Coeur d'Alene River at Harrison are estimated.

10.2.2 Lead in Floodplains and Wetlands

Sediments throughout the floodplains of the lower Coeur d'Alene 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.

The long-term goal is to reduce metal exposure of plants, wildlife, and fish throughout these areas to levels that are fully 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 the ecosystem locally. For example, one interim benchmark is the reduction of waterfowl mortality. Resource agencies have identified high-priority areas in the lower basin based on high waterfowl use and high levels of lead in sediments, including the wetlands surrounding Thompson Lake and the area known as Strobl Marsh. Figure 10.2-1 shows the rank order of average lead concentration in sediment and average feeding density at various areas within the Lower Basin, including Thompson Lake and Strobl Marsh.

A combination approach is envisioned for these areas. Contaminated materials would be excavated from some areas and transported to a repository or a local area within the lateral lakes for consolidation. Other areas would be capped with a layer of clean soil to prevent feeding birds from becoming exposed to metals. If feasible, capping materials would be obtained from

sources within the wetland unit, with the possibility of creating new ponds to increase diversity of habitat 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 initial phases of cleanup would include remediation of Thompson Lake and Strobl Marsh. Based on the numbers of waterfowl that feed at these areas as a percentage of the total numbers of waterfowl feeding in the Lower Basin, a mortality reduction of at least 17 percent is anticipated. The actual reduction in mortalities could be higher because the concentrations of lead in sediments at these areas, and therefore the lead exposure, is high relative to other feeding areas.

Hydraulic controls (floodgates) and levees may also be required to prevent recontamination of treated areas. The need for these types of structures would be evaluated during remedial design. Once these areas have been cleaned up, other contaminated wetland units would then be addressed.

An important goal is full return of cultural resources and recreational uses in the Basin. To reduce exposures associated with these uses, all remedies that address wetland risks to waterfowl would contain habitat enhancement components that enhance water potato grounds as well as recreational beaches. The use of warning signage in the Lower Basin is not preferred as the long-term solution.

10.2.3 Particulate Lead in Surface Water

Lead in surface water is transported downstream to Coeur d'Alene Lake and the Spokane River, and may wash across and contaminate the floodplain during flood events. Two sources are suspected to contribute the major lead load in the Lower Basin: contaminated riverbank materials and sediments in the riverbed. The riverbanks in many areas of the Lower Basin are steep and actively eroding into the river, primarily due to boat wakes. Riverbed sediments have become contaminated from materials transported from upstream and from the eroding riverbanks. This sediment is likely to be entrained during flood events and transported out of the river channel into the floodplain, where it is deposited.

The 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 prevent recontamination of cleaned-up areas and the occasional exceedances of drinking water standards in Coeur d'Alene Lake and to protect wildlife from exposure.

For the initial phases of remediation, cleanup actions will focus on areas containing actively eroding riverbanks. The reaches for bank stabilization will be prioritized on the degree of erosion occurring and the concentrations of metals in the riverbank sediments. Remedial actions will include a combination of bioengineering and removals as necessary to create a sustainable

river ecosystem. The extent of removal of contaminated material will be determined by the concentrations of metals in the river bank material, the likelihood that stabilized banks will remain stable into the future, site accessibility, and the presence of infrastructure.

A preliminary estimate of the reduction in particulate lead load that may be achieved through a combination of bioengineering and bank wedge removals is about 14,000 kilograms per year.[5] This reduction represents about 10 percent of the estimated average total load of 130,000 kg per year of particulate lead that enters the river between Cataldo and Harrison as a result of bed and bank erosion. The estimates of load reduction and estimated average total load are subject to a considerable degree of uncertainty, and the actual load reduction achieved could be a larger percentage of the total load.

Although the overall reduction of lead load would be limited, there are compelling reasons to include bank stabilization as an initial action. The actively eroding riverbanks can be accessed relatively easily, and bank removals and stabilization should be relatively cost effective. Further, bank stabilization should be conducted prior to cleanup actions in downstream riverbed and floodplain areas to minimize recontamination.

A challenge of removal is to find a repository location in the Lower Basin for the excavated materials. Sediment traps to catch material transported from upstream may be effective in the Lower Basin but more study is required to evaluate these structures. Because of the unknowns associated with the long-term behavior of the riverbed sediments and the potential for recontamination from upstream, remediation of riverbed sediments is not considered to be a high priority at that this time. Further study may indicate that removals of riverbed sediments are warranted in certain areas to prevent recontamination and to provide protection of human health and the environment.

10.3 COEUR D'ALENE LAKE

The preferred alternative for Coeur d'Alene Lake is Alternative 2. The preferred alternative continues the approach developed by the public in cooperation with the Clean Lakes Coordinating Council, Coeur d'Alene Tribe, IDEQ, and others when they developed the Coeur d'Alene Lake Management Plan. Full implementation of the Coeur d'Alene Lake Management Plan is included in the preferred alternative to continue positive improvements in lake-water quality resulting from controls previously implemented.

[5] Based on an average lead concentration of 3,000 mg/kg; average bank erosion rate of 0.1 foot per year, 60% of bank length stabilized using bioengineering; and 40% of bank length remediated using bank wedge removal followed by stabilization using bioengineering.

10.4 SPOKANE RIVER

The preferred alternative for the Spokane River is Alternative 4. 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 shoreline sites and also a subaqueous site where sediment has accumulated directly behind Upriver Dam. These areas will be addressed to protect human health and the environment, and to comply with federal and state laws. A combination of access-controls, capping, and removals have been evaluated.

10.5 FUTURE REMEDIAL ACTIONS

The preferred alternative will include remedial actions that are anticipated to achieve remedial action objectives for protection of human health. However, implementation of a remedy that would achieve remedial action objectives for ecological protection would be substantially more costly and time-consuming. Although the decision on whether to identify Alternative 3 in the ROD as the preferred alternative and then incrementally phase the cleanup post ROD, or to limit the ROD to a portion of Alternative 3, will not likely be made until after the public comment period, the preferred alternative first phase will include an increment of cleanup that is designed to achieve visible, measurable improvement with respect to water quality to sustain fish, waterfowl protection, and particulate metal transport reduction, but would not achieve remedial action objectives basinwide. As previously discussed, attainment of RAO's requires the comprehensive remedy. Phasing allows EPA to value engineer the effectiveness of the earlier phase source-specific remedial actions and adjust future remedial actions accordingly. Subsequent RODs or amendments would serve to identify how additional phases would be implemented so as to complete necessary Basin-wide cleanup.

During and following implementation of the initial increment of ecological cleanup, monitoring would be used to identify additional remedial actions to continue progress toward attainment of remedial action objectives during subsequent increments.

10.6 NEEDED POST-ROD TREATABILITY STUDIES

Cleanup of the Basin, particularly with respect to ecological protection, would use a number of different remedial technologies. Some of these technologies would be applied over large areas, potentially larger than ever previously implemented. Implementation of innovative, untried technologies may be needed to successfully remediate the Basin. As a result, a relatively large degree of uncertainty is present with respect to the effectiveness of many remedial actions that may be implemented in the Basin. Treatability studies, which may range in size from bench-

scale testing to full-scale monitored removal actions, have been ongoing for a number of years and are expected to continue well into the remedy implementation phase.

10.6.1 Monitored Full-Scale Mining Waste Removal and Containment Projects

Full-scale mining waste removal and containment projects have been conducted as early removal actions within the Basin or as remedial actions within the Bunker Hill operable unit. Where monitoring data have been collected before and after the removal action, these actions can be useful for predicting the effectiveness of future actions. Monitored removal actions are summarized in Table 10.6-1.

10.6.2 Pilot and Laboratory Scale Studies

Pilot and laboratory scale studies have been conducted and are ongoing to evaluate the effectiveness of technologies and process options. The treatability studies are summarized in Table 10.6-1.

10.6.3 Potential Future Studies

A number of candidate laboratory and pilot scale treatability studies have been identified for evaluating the effectiveness of technologies for remediation of the Basin. The objectives of the candidate studies include:

- Identify reagents that are effective in removing metals from solution when employed in permeable reactive barriers.
- Identify reagents that can be applied to soils and sediments to physically or chemically stabilize contaminants in place.
- Identify optimum design configurations for constructed wetlands or bioreactors to reduce aqueous metal concentrations through use of natural processes.
- Identify amendments that can be added to indigenous non-productive soils to make them suitable as cover materials.
- Identify plant species that will rapidly establish themselves under sometimes-adverse conditions so that denuded areas can be revegetated.
- Identify stabilization/bioengineering techniques that will provide durable, self-maintaining bank and floodplain stabilization and improve habitat for aquatic and riparian fish and wildlife species.

- Identify appropriate dredging techniques and evaluate impacts from dredging and dredging effectiveness.

- Evaluate the effectiveness of confined aquatic disposal in confining and isolating sediments and reducing metal leaching from confined sediments.

- Test methods of hydraulic isolation and conduct seepage studies to identify locations where hydraulic isolation could be used to control metal-laden groundwater or surface water entering the Coeur d'Alene River system.

10.6.4 Potential Innovative Approaches

Consideration of innovative, untried approaches may be appropriate for highly impacted areas of the Basin where implementation of more conventional source control technologies may not be practical or cost effective. For example, Canyon Creek is heavily impacted by metals from a large number of sources. Instead of using conventional removal, containment, and treatment source control technologies to reduce metals concentrations in the creek water, which would be the default technology, an alternative approach would be to treat the creek water before it is discharged to the South Fork. A conceptual approach would be divert the creek through a very large permeable reactive barrier, possibly in the form of a treatment pond of a few acres in area.. A conceptual design of such an approach is shown in Figure 10.6-1. A treatability study would be required to evaluate the implementability of such an approach.

Table 10.2-2 shows potential reductions of dissolved zinc loads resulting from treatment of Canyon Creek at its mouth in combination with other actions identified under the preferred alternative. A metals reduction of 80 percent was estimated for treatment of Canyon Creek at its mouth. A reduction of zinc loads of about 27 percent in the South Fork at Pinehurst and 26 percent in the Coeur d'Alene River at Harrison is estimated. Preliminary feasibility analyses indicate a design treatment capacity of 60 cfs would be needed to achieve 80% metals removal. The estimated size of the treatment pond would be 8 to 10 acres, with an estimated capital cost of about $23 million and an estimated annual O&M cost of about $2.3 million.

A second alternative approach would be to reduce the toxicity of the water to aquatic life using chemical additions. The toxicity of the water decreases with increasing hardness, and chemical additions could be used to increase the water hardness.

10.7 PROBABILISTIC ANALYSIS OF POST-REMEDIATION METAL LOADING

A probabilistic analysis has been developed to quantitatively estimate potential post-remediation metal loadings in major streams of the basin. The analysis quantifies the probability that a remedial alternative or proposed remedy would actually meet cleanup goals. The analysis also

provides estimates of remedial effectiveness (remediation factors) required to meet target metal loadings and concentrations with specified probability at selected stream monitoring stations.

The analysis is being used to help select and prioritize cleanup efforts for the preferred alternative. The six remedial alternatives documented in the draft FS have been analyzed to estimate post-remediation loadings and the probability of meeting TMDLs and AWQC in the South Fork at Pinehurst and in the Coeur d'Alene River at Harrison. These results, together with similar estimates for various potential configurations of the preferred alternative, are being used to help develop the preferred alternative.

10.7.1 Objectives

The motivation for using a probabilistic analysis stemmed from the inherent complexity and resultant uncertainty associated with metal loadings and concentrations in basin surface waters, particularly under potential future, post-remediation conditions. The probabilistic analysis provides a rational way to deal with the uncertainty in predictions of the true future effectiveness of any given remedial alternative.

The analysis quantifies the probability that any given present estimate of future loading would be the *true* future value. From this, the probability that the true future loading would actually meet remediation goals is quantified. The probabilities measure the *reliability* that remediation goals would be met, where high probabilities indicate high reliability, and vice versa. The analysis thus allows reliable estimates to be made under the existing conditions of uncertainty.

10.7.2 Methods

Based on statistical analysis of available historic measurement data, lognormal probability distributions were found to accurately characterize the natural variability inherent in the pre-remediation or current stream loadings and concentrations in the basin. Lognormal distributions were also used to coherently quantify the uncertainty in the future effectiveness of potential remedial action based on the various (uncertain) variables used to estimate that effectiveness.

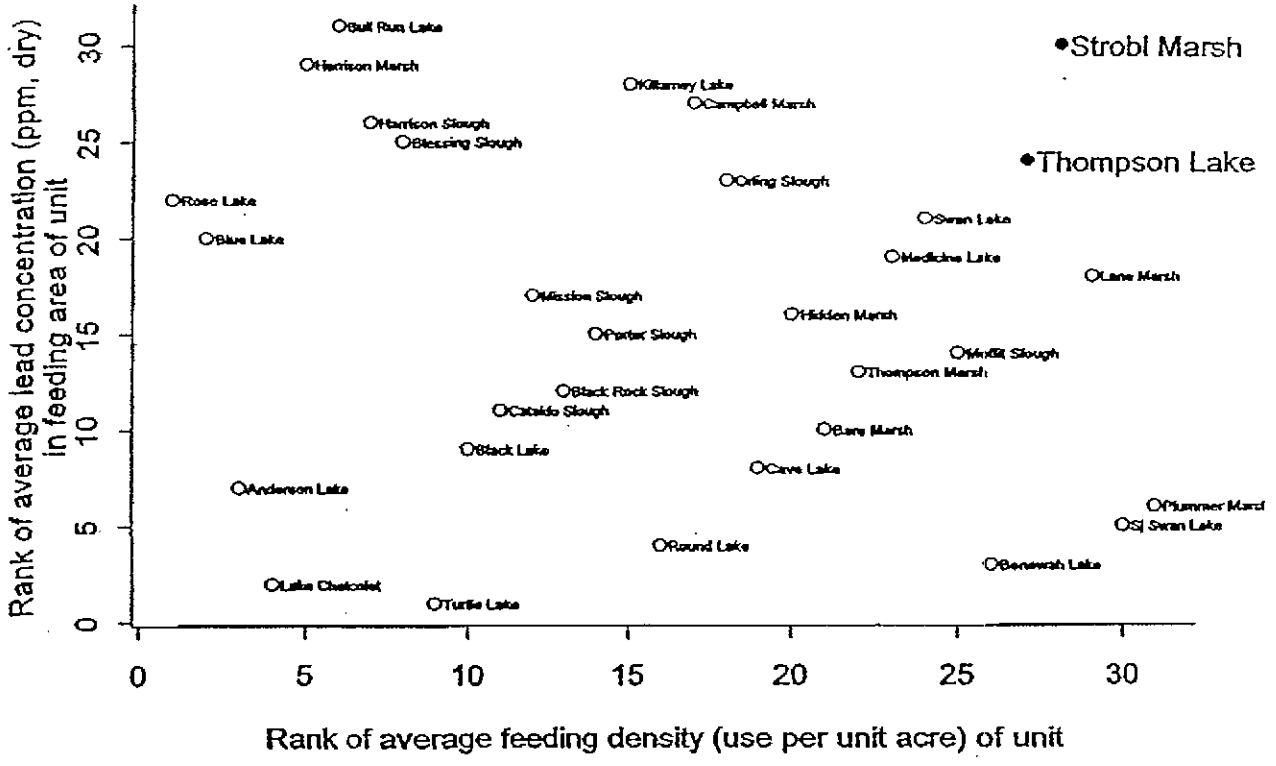
The uncertainty in post-remediation loadings mathematically combined both the natural variability in the stream system and the predictive uncertainty in the estimated remedial effectiveness. The resultant estimates quantify the probability that any given present estimate of future loading would be the true future value. Probabilistic estimates include the:

- Ratio of future loading over time to the TMDL loading capacity—termed the "load ratio"—which is also equal to the ratio of concentrations to AWQC. A load ratio of one or less means that the estimated loading is equal to or less than the

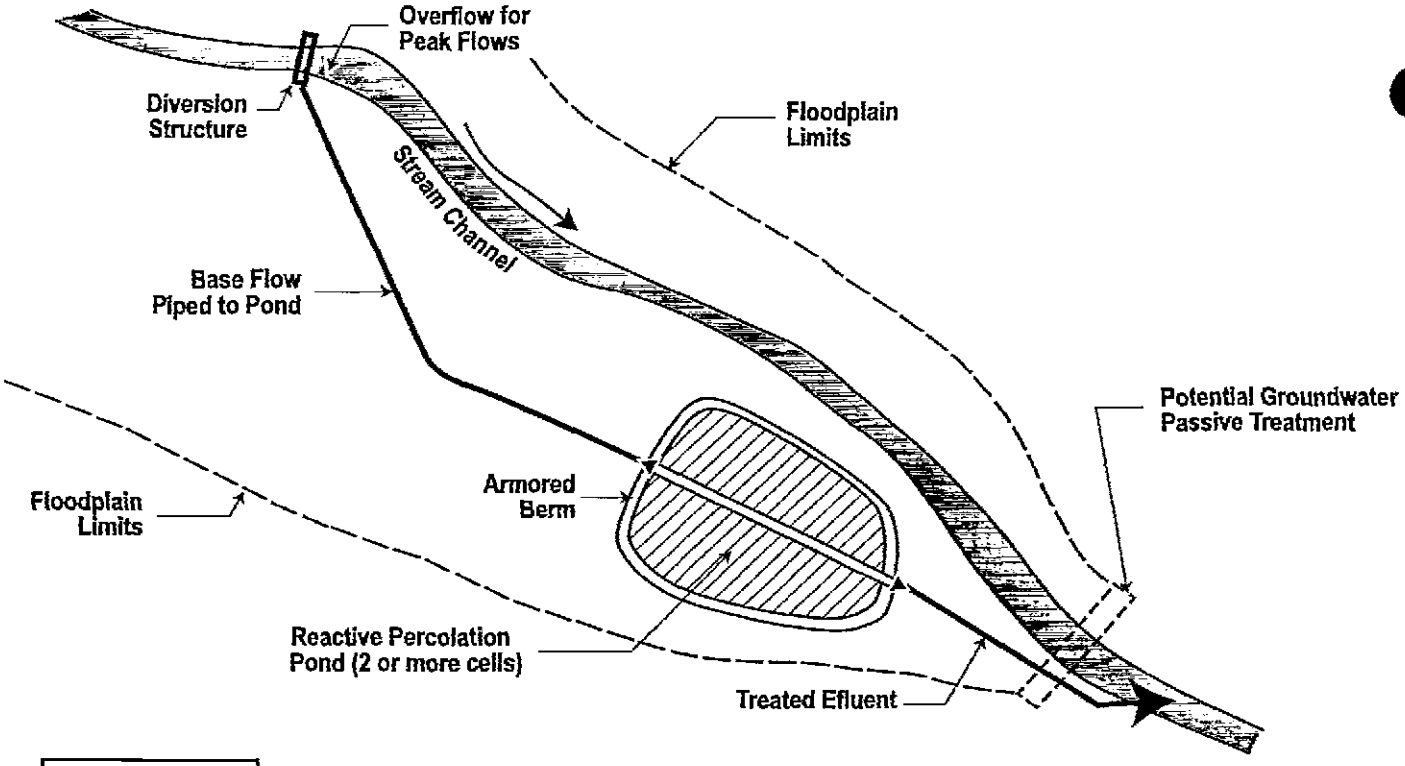
TMDL load capacity and that AWQC are expected to be met. (A load ratio of, say, 10 would indicate that loadings are 10 times the TMDL loading capacity, and that AWQC would be exceeded by a factor of 10). Estimates include load ratios having a 90 percent probability, or "reliability," of not being exceeded by the true future values.

- Expected values of remediation over time, including the post-remediation loadings having a 90 percent probability or reliability of not being exceeded by the true future loading.

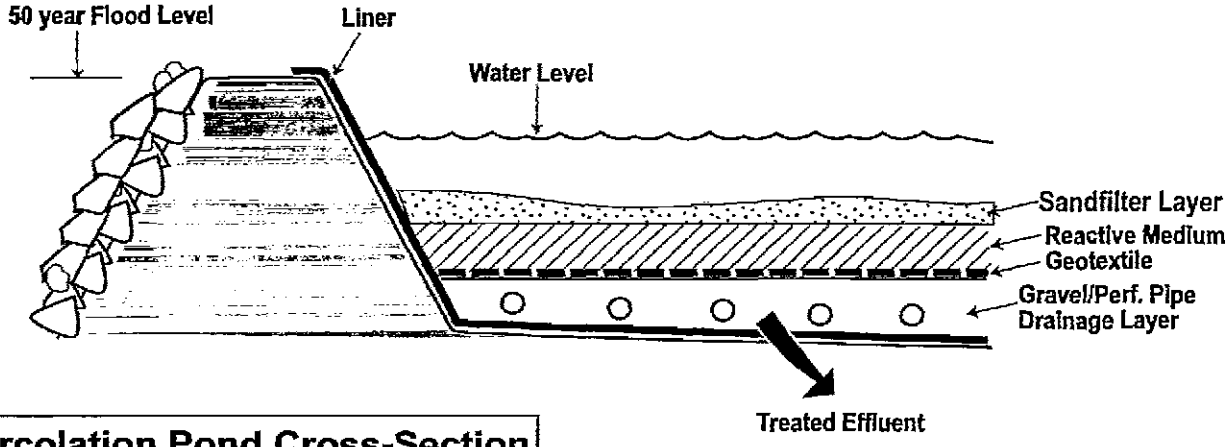
- Reduction of current loading needed to meet the TMDL loading capacity (and thus AWQC) with specified probability or reliability.



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	RRB16	**Figure 10.2-1** **Prioritization Chart for Wetlands in the Lower Basin Based on Lead Concentration and Waterfowl Feeding Density**



Plan View



Percolation Pond Cross-Section

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-08b 060101	Figure 10.6-1 Conceptal Design of Stream Flow Treatment in a Reactive Percolation Pond

Table 10.1-1
Preferred Alternative for Protection of Human Health

Media	Description of Preferred Alternative	Estimated Costs		
		Capital Cost	Annual O&M [a]	Total 30-Year NPV [b]
Soil	Information and Intervention and Partial Removal and Barriers	$84,500,000	$200,000	$87,000,000
Drinking Water	Public Information and Multiple Alternative Sources	$1,675,000	$43,000	$2,200,000
House Dust	Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning	$3,100,000	$83,000	$4,200,000
Fish Consumption	Information and Intervention and Monitoring	$0	$75,000	$930,000
Total		$89,300,000	$400,000	$94,000,000

[a] Average annual cost of O&M over 30-year period. Actual O&M costs will vary from year to year.

[b] Net present value including 30 years of O&M discounted at 7%. Capital costs are not discounted.

Table 10.2-1
Suggested Candidate Interim Benchmarks for Ecological Protection

Area	Benchmark	Estimated Results of Remedy Implementation	Estimated Cost[a]		
			Capital	Annual O&M	Total 30-year NPV
Ninemile Creek (Upper Basin) at mouth	Reduce metals concentrations in surface water and improve physical stream structure compatible with an adult native fishery	About 80% reduction in dissolved cadmium and zinc concentrations. Before implementation Cadmium = 22±10 µg/L Zinc = 3400±1600 µg/L After remedy implementation Cadmium = 4.4±2.3 µg/L Zinc = 680±350 µg/L (70 µg/L in DM)	$53,000,000	$500,000	$59,000,000
Pine Creek (Upper Basin)	Reduce metals concentrations in surface water and improve physical stream structure compatible with a fully-functional fishery	About 88% reduction in dissolved cadmium and zinc concentrations Before implementation Cadmium = .54 µg/L Zinc = 112±50 µg/L After remedy implementation Cadmium = 0.065±0.2 µg/L Zinc = 13±6 µg/L	$38,000,000	$320,000	$42,000,000
Strobl Marsh and Thompson Lake (Lower Basin)	Reduce lead ingestion to reduce waterfowl mortality	Conservative estimate of reduction of waterfowl mortality is 17%, based on feeding density alone. A greater reduction may be achieved because the metals concentrations at Strobl Marsh and Thompson Lake are relatively high.	$23,000,000	$230,000	$26,000,000
Lower Basin Riverbanks	Reduce particulate lead loading in Coeur d'Alene River at Harrison	Estimated reduction of particulate lead loading of about 10%	$47,000,000	$330,000	$51,000,000

[a] O&M costs discounted at 7 percent; capital costs are not discounted.

Table 10.2-2
Estimated Reductions in Zinc Loads Resulting From Remedy Implementation

Remedial Actions	Reduction in Dissolved Zinc Load	
	South Fork at Pinehurst	Coeur d'Alene River at Harrison
Comprehensive cleanup of Ninemile Creek and Pine Creek watersheds + upgraded treatment of Bunker Hill mine water	15%	12%
Comprehensive cleanup of Ninemile Creek and Pine Creek watersheds + upgraded treatment of Bunker Hill mine water + treatment of Canyon Creek at mouth using passive reactive barrier	27%	26%

Table 10.6-1
Summary of Monitored Removal Actions and Treatability Studies in the Coeur d'Alene Basin

Location	Agency	Description
Ninemile Creek: Interstate millsite removal action	SVNRT	Approximately 70,000 cubic yards of materials were removed from a floodplain and adjacent slopes during the summer of 1998. The materials were placed in an on-site repository, and the repository was closed during the summer of 1999.
Ninemile Creek: Success Mine and Millsite removal action	SVNRT	Groundwater intercepted using grouted cutoff wall and routed to passive water treatment system (fish bone apatite treatment medium). Constructed fall 2000.
Canyon Creek: Tailings-impacted Floodplains removal action	SVNRT	Removal of 600,000 cy of tailings from floodplains and millsites in lower Canyon Creek with disposal in a repository. Action conducted 1995-1998.
Moon Creek removal action	USFS	Removal of tailings and other contaminated materials at the Charles Dickens and Silver Crescent mine and millsites. About 130,000 cy of materials placed in an onsite repository. Two adits plugged. Action conducted 1998-2000.
Bunker Hill Operable Unit: Smelterville Flats	EPA	About 1,500,000 cy of tailings-impacted sediments removed and placed in the Central Impoundment Area. Action conducted 1998-1999.
Canyon Creek: Gem No. 3 Mine Water pilot study	SVNRT	Evaluation of combination aerobic/anaerobic passive water treatment system to remove dissolved metals. Ongoing
Upper South Fork: Morning No. 6 Mine and Millsite pilot study	IDEQ	Evaluation of different methods of revegetating waste piles. Ongoing
Bunker Hill Operable Unit: Bunker Hill Mine Water treatability study	EPA	Evaluation of active treatment options, including filtration, to achieve compliance with TMDL discharge requirements for cadmium, lead, and zinc. Completed 2000.
Lower Basin: Wetlands and Floodplains	EPA	Evaluation of soil treatment using phosphates to reduce lead bioavailability. Ongoing
Lower Basin: Dudley and Medimont	SVNRT/ IDEQ/SCS	Evaluations of bank erosion control using regrading, riprap, and hay bales. Conducted 1999 and 1994.

Notes:
EPA - U.S. Environmental Protection Agency
IDEQ - Idaho Department of Environmental Quality
SCS - U.S. Soil Conservation Service
SVNRT - Silver Valley Natural Resource Trustees
USFS - U.S. Forest Service

11.0 STATEMENTS FROM STAKEHOLDERS AND STATES

As this is an followup meeting to provide additional information and the stakeholder positions have not substantively changed, no stakeholder followup is believed necessary. However, we have received a report from an interested community group, of which an excerpted summary is attached as Appendix A.

Because the preferred alternative is still under development, formal comment letters from the stakeholders and the States do not exist. However, EPA has worked closely with these parties during the development of the preferred alternative. The following statements have been summarized from verbal and written comments and are believed to accurately portray the positions of these parties with respect to the current status of the preferred alternative as it is presented in this document.

11.1 STATE OF IDAHO

EPA and the State of Idaho have been working closely together in the development of the preferred alternative. The State supports protection of human health in the communities and common use areas as the top priority of the preferred alternative. The State also supports the incremental approach to implementation of the ecological remedy. The IDEQ has been actively involved in conducting and monitoring early removal actions, pilot studies, and treatability studies that will provide information on the types of remedial actions that will be effective in the Basin. The State of Idaho is very concerned about the use of remedies that would have high operations and maintenance requirements, such as active water treatment.

11.2 STATE OF WASHINGTON

The primary goals of the State of Washington as part of the near-term preferred alternative are to re-establish unrestricted access to shoreline recreational areas and remediate important fishery sites along the Spokane River, and to eliminate the potential for contaminant redistribution further down river. Washington is very concerned about the risks that exist to recreational users along the Spokane River. These exposures include contaminated beaches and fish consumption. The State of Washington does not support long-term reliance of institutional controls as an approach for reducing health risks along the Spokane River.

The State of Washington supports continued monitoring of the upper reaches of the Spokane River. This monitoring program approach will be required as long as constituents of concern from current and historical releases pass into the state of Washington.

The State of Washington believes surface water quality is being profoundly impacted in the vicinity of Kellogg and the BHSS (OU 2). The State of Washington believes the interim preferred alternative must include significant actions to define and continue implementing appropriate cleanup technologies that will significantly reduce dissolved zinc entering into the South Fork of the Coeur d'Alene River in this part of the Basin.

11.3 COEUR D'ALENE TRIBE

The Coeur d'Alene Tribe generally agrees with the proposed remedy for protection of human health in the communities of the Upper Basin. The Tribe is continuing to work with EPA and others to resolve human health issues in the Lower Basin.

The Tribe is also very concerned about the risk that exists to recreational and subsistence users in the Lower Basin. The Tribe believes these exposures include, but are not limited to, recreating on contaminated beaches, swimming in the Coeur d'Alene River, gathering water potatoes and other cultural plants throughout the wetlands, and eating large amounts of fish.

An important goal of the Coeur d'Alene Tribe is the full return of cultural resources and recreational uses in the Basin. Unrestricted use of these resources in the Lower Basin for Tribal cultural practices will require an aggressive long-term cleanup effort.

To reduce these exposures, the Coeur d'Alene Tribe would like all remedies that address wetland risks to waterfowl to contain habitat enhancement components that enhance water potato grounds as well as recreational beaches. The Tribe does not endorse the long-term use of warning signage in the Lower Basin as a solution to the environmental contamination.

Some questions have been raised by the Coeur d'Alene Tribe and others regarding the need to determine potential risks to humans who eat whole fish and fillets taken from fish in the lake. Previous fish tissue sampling efforts did not include whole fish from Coeur d'Alene Lake and fillets were found to contain elevated metal concentrations. As a result, some uncertainty remains about the potential risks resulting from eating fish from the lake. The Tribe will continue to seek a means to resolve this important human health concern.

11.4 SPOKANE TRIBE

The primary goal stated by the Spokane Tribe is to return their resources back to the pre-contaminated conditions in the shortest time possible to enable unrestricted use for subsistence and other cultural purposes. The Tribe believes that, while the incremental approach may influence short-term spending of Superfund dollars in the Silver Valley, an aggressive approach to cleanup will be required to comply with the NCP and to achieve long-term goals of protecting human health and the environment. Thus, the incremental approach cannot be employed without

also addressing present threats to human health and the environment that are not included in the preferred alternative. The Spokane Tribe opposes long-term institutional controls.

The Spokane Tribe has expressed concerns that the previous studies do not fully account for the metals exposures that may be experienced by tribal members that practice traditional cultural ways, including a subsistence lifestyle. EPA and the Tribe are cooperating in planning additional testing and studies to evaluate these exposures.

The Spokane Tribe also envisions the need for monitoring of water, sediments, fish, and vegetation of the Reservation. This monitoring program approach will be required as long as constituents of concern from current and historical releases pass into the reservation. A plan for monitoring the river where it passes through the reservation has been submitted by the Spokane Tribe to EPA for funding.

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APPENDIX A

"Get It Done, Collaborating for Basin Cleanup"
Coeur d'Alene Consensus Process
September 2000 – March 2001

"Get it Done, Collaborating for Basin Cleanup"
Coeur d'Alene Consensus Process, September 2000 – March 2001

Executive Summary

The consensus process focused on remediation of the sources addressed in the Coeur d'Alene Basin Feasibility Study and defined a general "common ground" remedial solution for the following four issues:

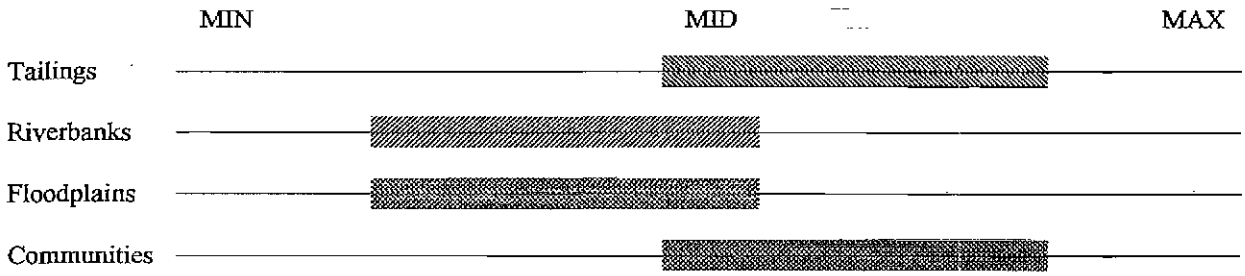
- Tailings along the South Fork and its Tributaries in the floodplain and on uplands that are major sources of zinc in the water;
- Banks and bed of the Coeur d'Alene River that are a major source of lead in the water;
- Floodplains along the River from Cataldo to Harrison that are a source of lead exposure to wildlife; and
- Sources of lead in communities that may be an exposure source to children including soil, indoor dust, and house paint.

These issues were selected for this process because they are major concerns in the Basin Feasibility Study. At the same time it was recognized that many other issues such as interim goals for water quality and priorities for source removals will require difficult decisions and may warrant a focused process for consensus building that can be part of implementation. In addition, topics not in the Basin Feasibility Study, such as the "Box", Coeur d'Alene Lake, Spokane River, TMDLs, and the UPRR right-of-way may be appropriate for a similar process. The list of stakeholders participating in the process is attached. While participation levels varied, all Stakeholders received ongoing communication and information.

The process dealt with the difficult interface between science/engineering, regulatory policy and community values, although timing of the effort did not allow for a detailed discussion of technical considerations. The large-scale technical facts were represented and incorporated into a framework of community values and acceptance. Discussion about national environmental policy was not addressed.

The Stakeholders identified a range of remedial actions within a broad range from maximum (relying predominately upon removals) to minimum (relying heavily upon natural attenuation, institutional controls, and monitoring). The "common ground" ranges of remedial activity are illustrated in the following figure.

Figure 1. Ranges of "Common Ground" for Remedial Activities



The ranges of "common ground" were not developed from detailed technical discussion, rather they reflect a coupling of values of participating Stakeholders with a general understanding of the technical aspects of the issues.

General Points of Consensus. There was a strong feeling that the remedy must protect human health and the environment and that those goals could be achieved through remediation within the range of "common ground". Remediation within the "common ground" range was believed to address habitat improvement in the Basin. While the group discussed the difficult questions about how to manage environmental disruptions, truck traffic, wear and tear of infrastructure, O&M and liability for repositories, funding, institutional controls and O&M of remedial actions the only solution identified was to minimize these impacts by careful and thoughtful decisions on removal actions. It was noted that these questions need to be addressed under a mid-range solution but that their magnitude is less than with a remediation plan utilizing maximum removal. In addition, it was noted that managing these issues will require a good working relationship among all of the Stakeholders and that a collaborative, open and inclusive implementation structure will foster necessary cooperation. It was recognized that there was a need to improve communication between those with technical understanding and those Stakeholders in the community without technical backgrounds.

In addition to the identification of a "common ground" remedial solution, there was strong consensus that a similar forum should be continued to assure public input throughout the duration of remediation activities. Other points of consensus relating to remedial implementation were:

- Management, direction and oversight of implementation should include Federal, State, Regional, Tribal and community involvement;
- To the extent practicable, the goal for utilization of the local workforce should be a "Project Labor Agreement," which would guarantee local hire, payment of prevailing wage, family health insurance and retirement benefits, and apprenticeship opportunities;
- Private property must be respected, i.e. no eminent domain; and
- Management of the remediation should be an iterative design process that reflects "learning from experience" with local input.

There was consensus that cleanup should start with sources representing the greatest impacts to human health and the environment and that work in the "Box" should be finished. Among a number of other important factors this group identified the importance of using cost/benefit analysis to guide prioritization. Concerns about uncertainties and unknowns in the effectiveness of the various solutions were recognized. In general, concerns were expressed about the:

- Unknowns in the effectiveness of remedial actions to achieve goals;
- Impossibility of complete removal;
- Potential secondary effects and disruptions (environmental and socio-economic) from remedial actions;
- Consequences of leaving inaccessible source material in place; and
- Practical considerations such as accessibility, dust and haul-traffic as well as the need to prevent recontamination.

Concerns about funding the capital costs and O&M were recognized. The need to maintain areas for recreation and access to those areas was identified. It was noted that implementation must be

based upon accurate technical information and that peer review may be necessary when there is significant disagreement about technical points. Also, technical facts must be distinguished from environmental policy.

Tailings. There was consensus that remedial activities within the "common ground" range for tailings should aggressively remove accessible tailings in the floodplain of the upper Basin that are contributing a major load of metals to the River. Tailings out of the floodplain should be stabilized against erosion and human health exposures. It was recognized that there are large amounts of inaccessible tailings under I-90, communities, and private property and that treatment of contaminated water from these sources is the preferred solution if this load needs to be reduced. Planning and implementation of the remediation must always be open to emerging technologies. Low priority sources such as waste rock were not addressed in this process.

Riverbanks, Bed and Floodplain. Selection of specific remedial activities within the "common ground" range for riverbanks and floodplains called for a balance among the tradeoffs of disruptions of removals, economic and social costs, use restrictions on public and private land, and the time for achieving goals through natural attenuation. The "common ground" range includes a mix of localized removals and management of soil in-place. There was consensus that prioritization is necessary and that Thompson Lake, Swan Lake, and Stobel Marsh were priority areas. Concerns were identified about the unknowns relating to the natural processes operating in the River and its floodplains, and the uncertainty in predicting the outcome of remedial actions. It was agreed that more study is needed to make detailed decisions on what is necessary to stabilize the riverbanks and bed against erosion. There was an agreement that soil treatment, to reduce bioavailability of lead and improve productivity, is an option worth exploring. Development of technologies should learn from what is already in use by landowners and being studied in other States.

Communities. Remedial activities within the "common ground" range for communities should include outdoor and indoor sources, intervention during remediation, long-term institutional controls and education on lead exposure. The remedy will provide a level of effort that, (1) is protective enough of children's health for people to want to buy property and live in the communities, (2) does not destroy the communities with massive removals, and (3) will not strangle the communities with long-term institutional controls. There seemed to be agreement that an endpoint of no more lead-testing and no more "digging" is desirable. Education and controls against recontamination were identified as key aspects of a remedy to deal with the situation of many communities built on mine waste materials and the impossibility of removing all of the lead. It was noted that while this range of cleanup effort addresses soils and dust with concentrations greater than an action level, it does not address selection of the action level. The opinion that a standardized finger-prick method for blood-lead testing should be used was not countered.

Consensus Process. Planning of this consensus effort began in spring of 2000. At least 7 days of workshops and meetings were held between September 2000 and February 2001. The scope and schedule of the process was set to correspond with that of the Remedial Investigation/ Feasibility Study being prepared by EPA for the Basin. Topics that were not in the Basin Feasibility Study such as the "Box", Coeur d'Alene Lake, Spokane River, TMDLs and UPRR right-of-way were not part of the scope of this process.

The process generally followed four steps:
1) planning to define the scope and practical considerations of time and resources;
2) brainstorming to identify the issues within the scope for discussion and document all comments and points of view;
3) organizing the information from the participants to define a range of alternatives and their associated concerns; and
4) making choices and defining common ground.

Prior to the first meetings, many of the Stakeholders were interviewed about their hopes and expectations for the process. There was a general commitment among those interviewed that "personal agendas" and "baggage" must be left at the door, and broad agreement that a process to have constructive dialogue with others of differing perspectives was welcome. Since this was a new experience for many of the participants, "trust building" exercises were included in the first couple workshops.

The sessions were open and information distributed freely, providing the opportunity for Stakeholders to work with their neighbors. All information was put up on large boards for all to see and challenge. The open discussions provided a forum to understand each other's point of view and to appreciate the other's dilemma. The methodical development of the range of cleanup alternatives allowed learning and understanding of pros and cons that come along with each alternative.

Three Public Summit meetings were held near the close of this effort. Comments from the Public Summit generally reflected many of the same thoughts that had been voiced by the participants:
- How will the outcome of this process be used?
- How will the effort be continued both in schedule, scope and process?
- Many issues of concern were not included in the scope of this first effort such as UPPR Rails-to-Trails, Burke Canyon, TMDLs, financing and the Superfund designation.
- The desire for a project labor agreement.
- The need to balance environmental improvement with negative impacts such as top-soil depletion.

In addition comments from both those that believe the process focused on too much cleanup and those that believed that process focused on too little cleanup expressed skepticism that the process represented their views. There was also concern expressed about the accuracy of government sponsored technical information and the need for peer review. It was noted that there needs to be more effort given to bridge the interface between technical information and values of the communities.

As this activity comes to a close, many Stakeholders have confirmed the value of discussion with other Stakeholders with differing perspectives. The process introduced a vehicle to the Stakeholders of the Coeur d'Alene Basin to bring other issues to the table for discussion and problem solving. Participants complemented the candor and respectful tone of the discussions and noted that the level of agreement increased as understanding increased. Regret was expressed about the difficulty in scheduling workshops so that everyone could regularly attend and the pressure of deadlines that were inherent in the process.

Stakeholders Identified for CdA Basin Consensus Process

Benawah County Commissioners
Building and Construction Trades Council
Coeur d'Alene Basin Restoration Project Citizens Advisory Commission
Coeur d'Alene Basin RI/FS Task Force Citizens Advisory Committee
Coeur d'Alene Tribe
Cities of Coeur d'Alene, Post Falls, Harrison, Mullan, Osburn, and Wallace
CLEAN - (Community Leaders for EPA Accountability Now)
Congressman Butch Otter
Idaho Department of Environmental Quality
Idaho Department of Lands
Idaho Fish & Game
Kootenai County Commissioners
Kootenai Environmental Alliance
Lake Shore Property Owners Association
Landowners and interested citizens
Mining Industry
Panhandle Health District
Senator Clyde Boatwright
Senator Larry Craig
Senator Mike Crapo
Shoshone County Commissioners
Shoshone Natural Resources Coalition
Spokane County Commissioners
Spokane River Property Owners Association
Spokane Tribe
U.S. Bureau of Land Management
U.S. Environmental Protection Agency
U.S. Fish & Wildlife

Supplemental Compact Disk

B2 2001 NRRB Presentation and Previous Actions

B2-1 2001 National Remedy Review Board Presentation Information, Coeur D'Alene Basin Remedial Investigation/Feasibility Study
B2-2 Summary of Previous Remedial Actions in Upper Basin
B2-3 Summary of Previous Studies in Upper Basin, 2001 to 2008

B6 RME Risk Characterization Summary and Ecological Risk Assessment Tables

B6-1 Carcinogens Residential Exposure Scenario – Child/Adult
B6-2 Non-Carcinogens Residential Exposure Scenario – Child
B6-3 Non-Carcinogens Residential Exposure Scenario – Child/Adult
B6-4 Non-Carcinogens Public Recreational Exposure Scenario – Child
B6-5 Carcinogens Subsistence Exposure Scenario – Child/Adult
B6-6 Non-Carcinogens Subsistence Exposure Scenario – Child
B6-7 Non-Carcinogens Subsistence Exposure Scenario – Child/Adult
B6-8 Summary of Results from the Coeur d'Alene Basin Ecological Risk Assessment
B6-9 Summary of Results from the Measures of Ecosystem and Receptor Characteristics Analysis in the Coeur d'Alene Basin Ecological Risk Assessment

B7 PRG Tables

B7-1 Preliminary Remediation Goals for Soil (mg/kg) for Protection of Terrestrial Biota in the Upper Coeur d'Alene Basin
B7-2 Preliminary Remediation Goals for Soil (mg/kg) for Protection of Aquatic Birds and Mammals in the Upper Coeur d'Alene Basin
B7-3 Preliminary Remediation Goals for Sediment for Protection of Human Health and Aquatic Organisms in the Upper Coeur d'Alene Basin

B12 ARAR Tables

B12-1 Potential Chemical-Specific ARARs and TBCs for Human Health and Ecological Receptors in the Upper Coeur d'Alene Basin
B12-2 Potential Chemical-Specific ARARs for Groundwater and Surface Water as Drinking Water in the Upper Coeur d'Alene Basin
B12-3 Potential Location-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
B12-4 Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin

B14 Cost Analysis Documentation

B14-1 Appendix D, Volume 3, Draft Focused Feasibility Study Report, Upper Basin of the Coeur d'Alene River, Bunker Hill Mining and Metallurgical Complex, Superfund Site

SF/AR 2.10.2
7/17/01

COEUR D'ALENE BASIN

National Remedy Review Board Presentation Information

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NATIONAL REMEDY REVIEW BOARD PRESENTATION INFORMATION
COEUR D'ALENE BASIN REMEDIAL INVESTIGATION/FEASIBILITY STUDY

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EXECUTIVE SUMMARY

Site Summary

The Coeur d'Alene Basin is located in northern Idaho and northeastern Washington and consists of the South Fork of the Coeur d'Alene River (the "Upper Basin"); the lower Coeur d'Alene River (the "Lower Basin"); Coeur d'Alene Lake; and the Spokane River. The site has been assigned CERCLIS identification number ID048340921.

Most of the site is undeveloped and includes large areas of federal and state land. Developed land uses include residential, recreational, agricultural, and light urbanization or industrialization. Human habitation is primarily concentrated in communities along the South Fork Coeur d'Alene River (South Fork) and population centers in the cities of Coeur d'Alene and Post Falls, Idaho, and Spokane, Washington. The Basin is the ancestral home of the Coeur d'Alene Tribe with Tribal lands present in the Lower Basin. The Spokane Tribal lands are present along the lower Spokane River in the state of Washington.

Within the site, historic mining practices, beginning in the late 1880s, have resulted in widespread contamination. The contamination threatens both human health and the environment. The site contaminants are primarily metals, and the metals considered of principal concern include lead and arsenic for protection of human health, and lead, cadmium, and zinc for protection of ecological receptors. The affected media are soil, sediment, surface water, and groundwater.

Until 1968, most tailings were discharged directly into the South Fork or its tributaries. 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/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Upper and Lower Basin 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 impacted materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres. Leaching and erosion of tailings-impacted sediments is the primary source of metals in surface water. Direct exposure to metals in sediments is a source of risk for human and ecological receptors, including recreational users, subsistence users, migrating waterfowl, and plants.

Four operable units (OUs) have been identified in the National Priority List (NPL) site. OUs 1, 2, and 3 are located within the Bunker Hill Superfund Site (BHSS), a 21-square-mile rectangular area that spans the lower South Fork. The BHSS was the site of some of the most highly-impacted materials within the Basin. The OUs are described as follows:

- **OU 1: Populated areas of the BHSS.** A Record of Decision (ROD) for OU 1 was signed in 1991, and remedial activities have been conducted since 1994. Completion of remedy implementation is anticipated in 2003.

- **OU 2: Non-populated areas of the BHSS.** A ROD for OU 2 was signed in 1992. Phase I remedial actions are largely aimed at consolidating the most extensive contamination from various areas of the site, and are estimated to be mostly complete in 2001. Phase II will address surface water and groundwater cleanup.

- **OU 3: Central Treatment Plant (CTP).** The CTP is an active water treatment facility that treats acid mine drainage from the Bunker Hill mine. The CTP has been in operation since 1974, and in 1998, a remedial investigation/feasibility study was initiated to address upgrading the treatment plant to meet total maximum daily load (TMDL) discharge requirements.

- **OU 4:** All areas of the Basin outside of the BHSS where mining-related contamination is located. OU 4 extends from near the Idaho-Montana border into the state of Washington, and includes floodplains, communities, lakes, rivers, and tributaries.

Risk Summary

The primary human health concern in the Basin is lead in the blood of children and pregnant women. Blood lead surveys have noted excessive levels of blood lead in children, with only minor problems among adults. Site-specific analysis of blood lead data paired with environmental lead data suggests complex exposure pathways. Blood lead levels appear to be most closely related to lead in house dust, followed by independent effects of lead in yard soil, the condition of interior lead-based paint, and the lead content of exterior paint (TerraGraphics and URSG 2000). High blood lead levels in the Lower Basin have been associated with homes that were flooded in 1996, and recreational activities outside the home (TerraGraphics and URSG 2000).

Individuals who practice a subsistence lifestyle would face substantially higher risks resulting from consuming large amounts of fish and native vegetables, higher exposure to soil and sediment, and potential ingestion of untreated surface water. Current levels of contamination preclude subsistence use of these resources by the tribes and other potential users. Current health advisories related to recreational activities include fish consumption advisories and warning signage at beaches and swimming areas in the Lower Basin and the Spokane River.

Most watersheds in which mining has occurred and a large portion of the Basin downgradient of mining areas are ecologically degraded. Some of the more severe and visible impacts include:

- Approximately 20 miles of the South Fork and 10 miles of tributaries are unable to sustain reproducing fish populations. Species density and diversity are reduced throughout the Basin. 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). The ambient water quality criteria for zinc and cadmium are exceeded throughout the Coeur d'Alene River system downstream of mining impacts, in Coeur d'Alene Lake, and in the Spokane River.

- Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. The total number of waterfowl dying of lead poisoning has not been estimated; however, 682 dead or sick birds were found in the Basin between 1992 and 1997. 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 at reference sites nationally.

- Concentrations of metals in riparian soils along the Coeur d'Alene River, the South Fork, and its tributaries are sufficiently high to be toxic to vegetation.

The ecological risk assessment concluded that high concentrations of metals are pervasive in the soil, sediment, and surface water, where they pose substantial risks to plants and animals that inhabit the Basin. Cadmium, lead, and zinc pose the greatest risk to ecological receptors. Few species had no identifiable risks. Unacceptable risks were identified for all receptor classes.

Numerous species 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 U.S. Fish and Wildlife Service as species of concern, state-listed sensitive plant species, and culturally significant plant species. Examples include the bull trout, westslope cutthroat trout, bald eagle, black tern, gray wolf, lynx, spotted frog, Ute ladies'-tresses, and water potato.

Remediation Goals

Remediation goals for protection of human health are focused on targets established by the U.S. Environmental Protection Agency (EPA) for children's blood lead levels:

> *Prevent the exposure of humans to lead in soil and other media such that there is a 95% or greater probability that a child or children ages 0 to 84 months have blood lead levels less than 10 µg/dL, and a 1% or lower probability that a child or children ages 0 to 84 months have blood lead levels greater than 15 µg/dL.*

Remediation goals for ecological protection are focused on compliance with applicable or relevant and appropriate requirements (ARARs) for surface water quality and preventing exposures of ecological receptors to metals in soil and sediment at concentrations that result in toxic effects. Attaining water quality standards will provide for the protection and propagation of fish and wildlife and for recreation in and on the surface waters and take into consideration the use and value of the waters in the Coeur d'Alene Basin. However, given the extent of contamination in the Basin, it is expected that either a tremendous amount of capital expenditures or an extended period of time will be required to achieve full ecological protection.

As part of the preferred alternative implementation for ecological protection, EPA is evaluating an incremental approach to remediation. This involves phasing the cleanup over an extended period, which could result in a significant cost savings compared to a lump sum full funding. To illustrate this, a 7% discount on a $1 billion remedy implemented over a 50-year time period in equal 5-year increments would result in an approximately $670 million savings in capital costs. This phased approach also allows greater efficiencies, because observations of the effectiveness of selected remediation technologies can be assessed and subsequent phases adapted to maximize the cleanup results. As part of the public comment process, we will solicit input on the appropriate set of interim benchmarks, which are near-term goals that would serve as landmarks to measure the progress of the remedy toward achievement of the long-term remediation goals. Given that full implementation of the preferred alternative for ecological protection is necessary to achieve protectiveness and that we hope to pursue an "observational" or "adaptive management" approach, the interim benchmarks we are considering are:

- Achieve sufficient water quality to sustain fish in selected watersheds or segments of the Upper Basin
- Reduce waterfowl mortality in the lower Basin
- Reduce transport of particulate lead, which impacts both ecological and human health to floodplains, Coeur d'Alene Lake, and the Spokane River

Description of Alternatives

Alternatives were developed for protection of human health in the communities and at common use areas (the human health alternatives) and for protection of ecological receptors (the ecological alternatives); protection of ecological receptors also overlaps with components of human health protection in recreational areas with beaches and floodplain sediments, waste piles, and abandoned mill sites.

The human health alternatives were developed by medium. Alternatives were developed for soil, drinking water, house dust, and fish consumption. The human health alternatives are summarized in Table ES-1, with the preferred alternative highlighted.

The ecological alternatives were developed by geographical area. Alternatives were developed for the Coeur d'Alene River Basin (including the Upper Basin and Lower Basin), Coeur d'Alene Lake, and the Spokane River. Reflecting a comprehensive approach, the ecological alternatives were assembled to deal with both "local" site-specific effects and "global" site-wide effects. The ecological alternatives are also summarized in Table ES-1.

Preferred Alternative

Although the details of the phasing of the preferred alternative are still under development for ecological cleanup, remedies for protection of human health would be implemented as a first priority. Information from the implementation of the remedy in the BHSS was used to evaluate the range of cleanup alternatives. Based on this evaluation, the governments (which include the States of Idaho and Washington, and the Coeur d'Alene and Spokane Tribes) have general agreement on the proposed remedy for protection of human health in the communities of the Upper Basin. The governments are continuing discussions to identify appropriate solutions to resolve human health issues in the Lower Basin.

The preferred alternative for human health is based on the following alternatives developed for the feasibility study (FS):

- **Soil:** Alternative S4—Information and Intervention and Partial Removal and Barriers
- **Drinking Water:** Alternative W6—Public Information and Multiple Alternative Sources

- **House Dust:** Alternative D3—Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and contingent Capping/More Extensive Cleaning

- **Fish Consumption:** Alternative F2—Information and Intervention

In comparison to human health, it is a more difficult task to implement a comprehensive remedy for the protection of ecological life in the Basin. The FS showed that the long-term goals, such as meeting surface water quality standards for protection of aquatic life, would be difficult to achieve throughout the Basin given the extent of contamination. Therefore, the comprehensive alternatives presented in the FS are aggressive, some requiring a long time to implement at a significant cost. For the Upper Basin, these alternatives are a "roll-up" of selected technologies applied at the individual source level to effect remediation in the stream segment. The additive effects of the individual sources in the segments in turn improve the ecological health of the watershed which in turn improves the subbasin (referred to as a conceptual site model or CSM in the FS). The cumulative effect of source, segment, and watershed cleanups, therefore, eventually achieves the remedial action objectives for the entire Basin. Given the source-specific approach to remedial alternative selection, the alternatives include assumptions of source contribution and the effectiveness of remedial actions for stream segments and watersheds that are not fully understood at the Basin level. However, Alternative 3 for CSM Units 1, 2, and 3, Alternative 2 for CSM Unit 4, and Alternative 4 for CSM Unit 5 are the most cost effective alternatives, based on the FS evaluation of the comprehensive ecological remedies.

Given the costs involved and the amount of uncertainty, an incremental approach that uses the information available and learns from experience, is the preferred approach to implementing the preferred alternative. A number of benefits could be realized by using an incremental approach to remedy implementation:

- Remedies for protection of human health would be implemented in the communities as a first priority.

- Tangible, observable results could be achieved within a relatively short time in the areas addressed in the initial phase.

- The results of the phased remedy implementation would be monitored to improve the effectiveness of subsequent remedial activities.

- Opportunities would exist for innovative, more cost-effective technologies to evolve over time.

- The cost impacts would be significantly moderated.

Three priority issues have been identified as an initial primary focus with respect to ecological protection.

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams.** These metals have harmful effects on aquatic receptors, including fish, as described in the "Risk Summary."

- **Lead in wetlands and floodplains.** Existing lead contamination has harmful effects on waterfowl and plants, as described in Section 6, Summary of Risks.

- **Particulate lead in the surface water.** Lead transported downstream in the river system is a continuing source of contamination to 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 warning signs at beaches and swimming areas. During flood events, lead transported by the river also impacts the wetlands and floodplains. Implementation of the ecological remedies would also have important human health benefits, including additional protection for recreational users and sensitive populations and protection of future subsistence lifestyles. The human health exposure pathways addressed by the ecological remedies include ingestion of 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.

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

Focus	Medium/Area	Alternative Designation	Description	Estimated Capital Cost	Annual O&M[a]	Estimated Net Present Value Total Cost[b]
Human Health Protection	Soil	S1	No Action	$0	$0	$0
		S2	Information and Intervention	$4,170,000	$150,000	$6,070,000
		S3	Information and Intervention and Access Modifications	$2,200,000	$56,000	$2,900,000
		S4	***Information and Intervention and Partial Removal and Barriers***	***$84,500,000***	***$200,000***	***$87,000,000***
		S5	Information and Intervention and Complete Removal	$126,000,000	$160,000	$128,000,000
	Drinking Water (Interim Measures)	W1	No Action	$0	$0	$0
		W2	Public Information	$0	$35,000	$428,000
		W3	Public Information and Residential Treatment	$470,000	$77,000	$1,428,000
		W4	Public Information and Alternative Source, Public Water Utility	$10,370,000	$35,000	$10,800,000
		W5	Public Information and Alternative Source, Groundwater	$2,313,000	$47,000	$2,900,000
		W6	***Public Information and Multiple Alternative Sources***	***$1,675,000***	***$43,000***	***$2,210,000***
	House Dust	D1	No Action	$0	$0	$0
		D2	Information and Intervention and Vacuum Loan Program/Dust Mats	$349,000	$83,000	$1,380,000
		D3	***Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Contingent Capping/More Extensive Cleaning***	***$3,109,000***	***$83,000***	***$4,140,000***
	Aquatic Food Sources	F1	No Action	$0	$0	$0
		F2	Information and Intervention	$0	$19,000	$230,000
		F3	***Information and Intervention and Monitoring***	***$0***	***$75,000***	***$929,000***

Table ES-1 (continued)
Summary of Alternatives Developed for the Coeur d'Alene Basin

Focus	Medium/Area	Alternative Designation	Description	Estimated Capital Cost	Annual O & M[a]	Estimated Net Present Value Total Cost[b]
Ecological Protection	Coeur d'Alene Basin (including Upper Basin and Lower Basin)	1	No Action			$0
		2	Contain/Stabilize with Limited Removal and Treatment			
			- Upper South Fork	$38,000,000	$350,000	$42,000,000
			- Canyon Creek	$49,000,000	$970,000	$61,000,000
			- Ninemile	$22,000,000	$250,000	$25,000,000
			- Big Creek	$10,500,000	$97,000	$12,000,000
			- Moon Creek	$2,600,000	$33,000	$3,000,000
			- Pine Creek	$21,000,000	$180,000	$23,000,000
			- South Fork	$78,000,000	$550,000	$85,000,000
			- Lower Basin	$99,000,000	$1,100,000	$120,000,000
			Total	$320,000,000	$3,500,000	$370,000,000
		3	***More Extensive Removal, Disposal, and Treatment***			
			- Upper South Fork	$83,000,000	$730,000	$92,000,000
			- Canyon Creek	$150,000,000	$6,900,000	$230,000,000
			- Ninemile	$53,000,000	$470,000	$59,000,000
			- Big Creek	$27,000,000	$220,000	$30,000,000
			- Moon Creek	$3,000,000	$41,000	$3,600,000
			- Pine Creek	$38,000,000	$310,000	$42,000,000
			- South Fork	$170,000,000	$2,300,000	$200,000,000
			- Lower Basin	$630,000,000	$3,400,000	$650,000,000
			Total	***$1,200,000,000***	***$14,000,000***	***$1,300,000,000***
		4	Maximum Removal, Disposal, and Treatment			
			- Upper South Fork	$150,000,000	$1,500,000	$170,000,000
			- Canyon Creek	$180,000,000	$2,300,000	$210,000,000
			- Ninemile	$75,000,000	$580,000	$82,000,000
			- Big Creek	$46,000,000	$240,000	$49,000,000
			- Moon Creek	$3,700,000	$35,000	$4,100,000
			- Pine Creek	$67,000,000	$260,000	$70,000,000
			- South Fork	$210,000,000	$2,300,000	$240,000,000
			- Lower Basin	$1,600,000,000	$7,800,000	$1,700,000,000
			Total	$2,300,000,000	$15,000,000	$2,500,000,000

Table ES-1 (continued)
Summary of Alternatives Developed for the Coeur d'Alene Basin

Focus	Medium/Area	Alternative Designation	Description	Estimated Capital Cost	Annual O & M[a]	Estimated Net Present Value Total Cost[b]
Ecological Protection (Con't)	Coeur d'Alene Basin (including Upper Basin and Lower Basin)	5	State of Idaho Cleanup Plan			
			- Upper South Fork	$8,500,000	$120,000	$10,000,000
			- Canyon Creek	$25,300,000	$600,000	$32,000,000
			- Ninemile	$2,000,000	$43,000	$2,500,000
			- Big Creek	$0	$0	$0
			- Moon Creek	$0	$0	$0
			- Pine Creek	$6,200,000	$110,000	$7,500,000
			- South Fork	$35,000,000	$230,000	$38,000,000
			- Lower Basin	$150,000,000	$900,000	$170,000,000
			Total	$230,000,000	$2,000,000	$257,000,000
		6	Mining Companies Cleanup Plan			
			- Upper South Fork	$16,000,000	$110,000	$18,000,000
			- Canyon Creek	$58,000,000	$790,000	$68,000,000
			- Ninemile	$24,000,000	$180,000	$26,000,000
			- Big Creek	$10,000,000	$68,000	$11,000,000
			- Moon Creek	$320,000	$2,100	$350,000
			- Pine Creek	$12,000,000	$100,000	$13,000,000
			- South Fork	$16,000,000	$120,000	$18,000,000
			- Lower Basin	$34,000,000	$330,000	$40,000,000
			Total	$170,000,000	$1,700,000	$194,000,000
	Coeur d'Alene Lake	1	No Action			$0
		2	***Institutional Controls***	***$8,200,000***	***$130,000***	***$9,900,00***
	Spokane River	1	No Action			$0
		2	Institutional Controls	$6,400	$34,000	$428,000
		3	Containment with Limited Removal and Disposal	$920,000	$37,000	$1,400,000
		4	***More Extensive Removal, Disposal, and Treatment***	***$5,200,000***	***$68,000***	***$6,000,000***
		5	Maximum Removal and Disposal	$26,000,000	$66,000	$27,000,000

a Average annual cost of O&M over 30-year period. Actual O&M costs will vary from year to year.
b Net present value including 30 years of O&M discounted at 7%. Capital costs are not discounted.
Bold Italics = Preferred alternative

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A "Get It Done, Collaborating for Basin Cleanup," Coeur d'Alene Consensus Process, September 2000–March 2001

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1.0 SITE LOCATION AND DESCRIPTION

For the purposes of the RI/FS, the Coeur d'Alene Basin includes the Coeur d'Alene River and associated tributaries, Coeur d'Alene Lake, and the Spokane River downstream to the Washington State Highway 25 bridge at Fort Spokane on the Spokane Arm of Lake Roosevelt.[1]

The site has been assigned CERCLIS identification number ID048340921. Figures 1.0-1 through 1.0-6 present a map of the greater than 160-river-mile-long site. For purposes of the remedial investigation and feasibility study, the Basin has been divided into five conceptual site models (CSMs). CSMs 1 and 2 represent the Upper Basin, which is the source for most of the mining-related waste materials. It includes the Canyon Creek, Ninemile Creek, Big Creek, Moon Creek and Pine Creek watersheds. These in turn are divided into segments, which are themselves composed of source areas. There are approximately 1,100 separate source areas in the Basin. CSM 3 is the Lower Basin, which includes the Coeur d'Alene River, adjacent lateral lakes, floodplain, and associated wetlands. CSM 4 is Coeur d'Alene Lake, and CSM 5 is the depositional areas and continuing secondary sources on the Spokane River, which flows from Coeur d'Alene Lake.

Within the Basin, historic mining practices, beginning in the late 1880s, have resulted in widespread contamination. The contamination threatens both human health and the environment. The site contaminants are primarily metals, and the metals considered of principal concern include lead and arsenic for protection of human health, and lead, cadmium, and zinc for protection of ecological receptors.

The site contains the Bunker Hill Superfund Site (BHSS), a 21-square-mile rectangular area that spans the lower South Fork of the Coeur d'Alene River (South Fork). The BHSS was the site of the most intensive mining activities, and was the location of some of the most highly-impacted materials within the Basin. The BHSS is the subject of two existing Records of Decision (RODs), one for populated areas (signed in 1991) and one for non-populated areas (signed in 1992). Removal actions were initiated in 1986, and remedial activities have been ongoing since 1994.

[1] Coeur d'Alene Lake and the upstream watershed were originally the extent of the study area, but the Spokane River was subsequently added without a change in the project name.

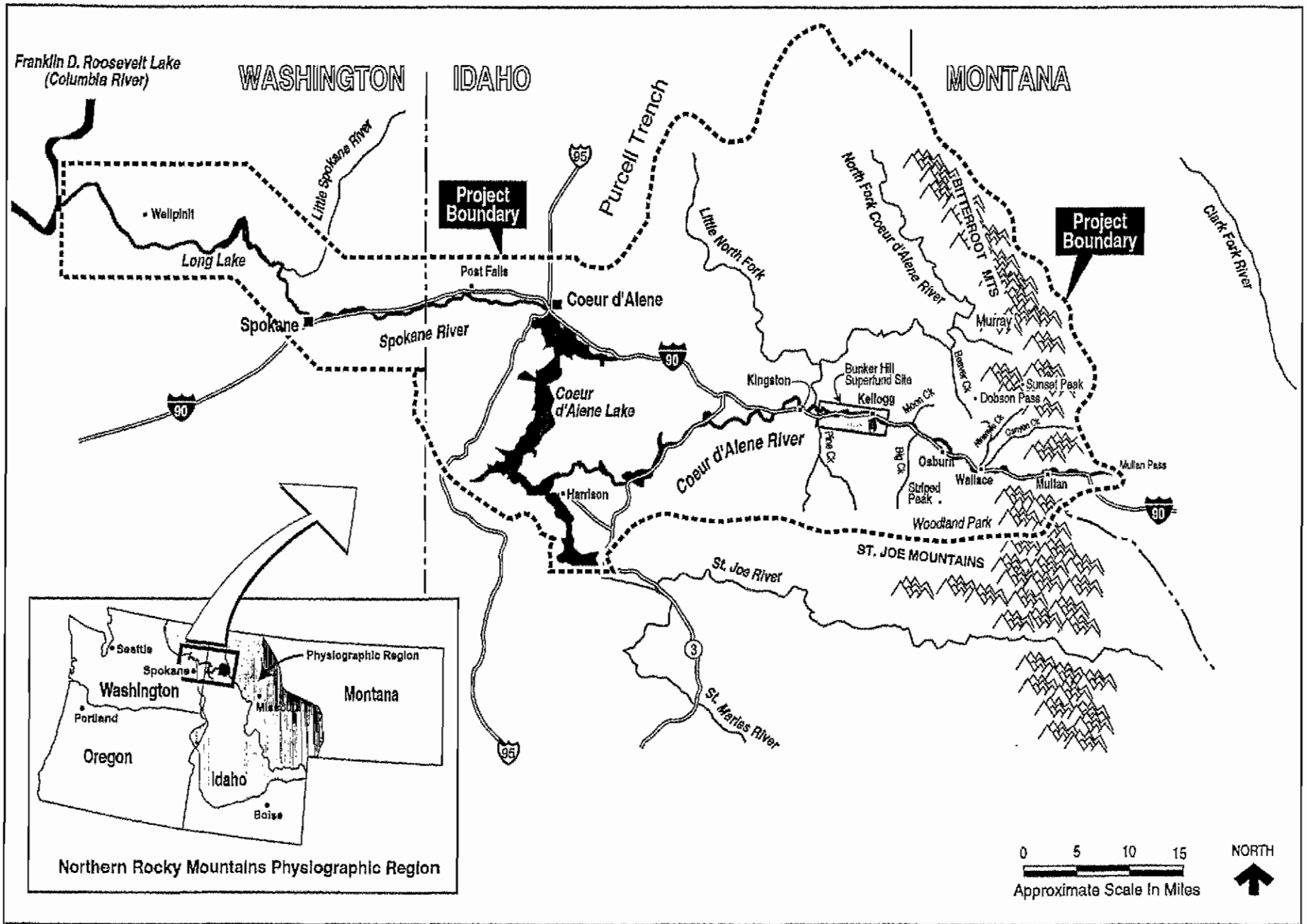

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Figure 1.0-1
Project Location Map

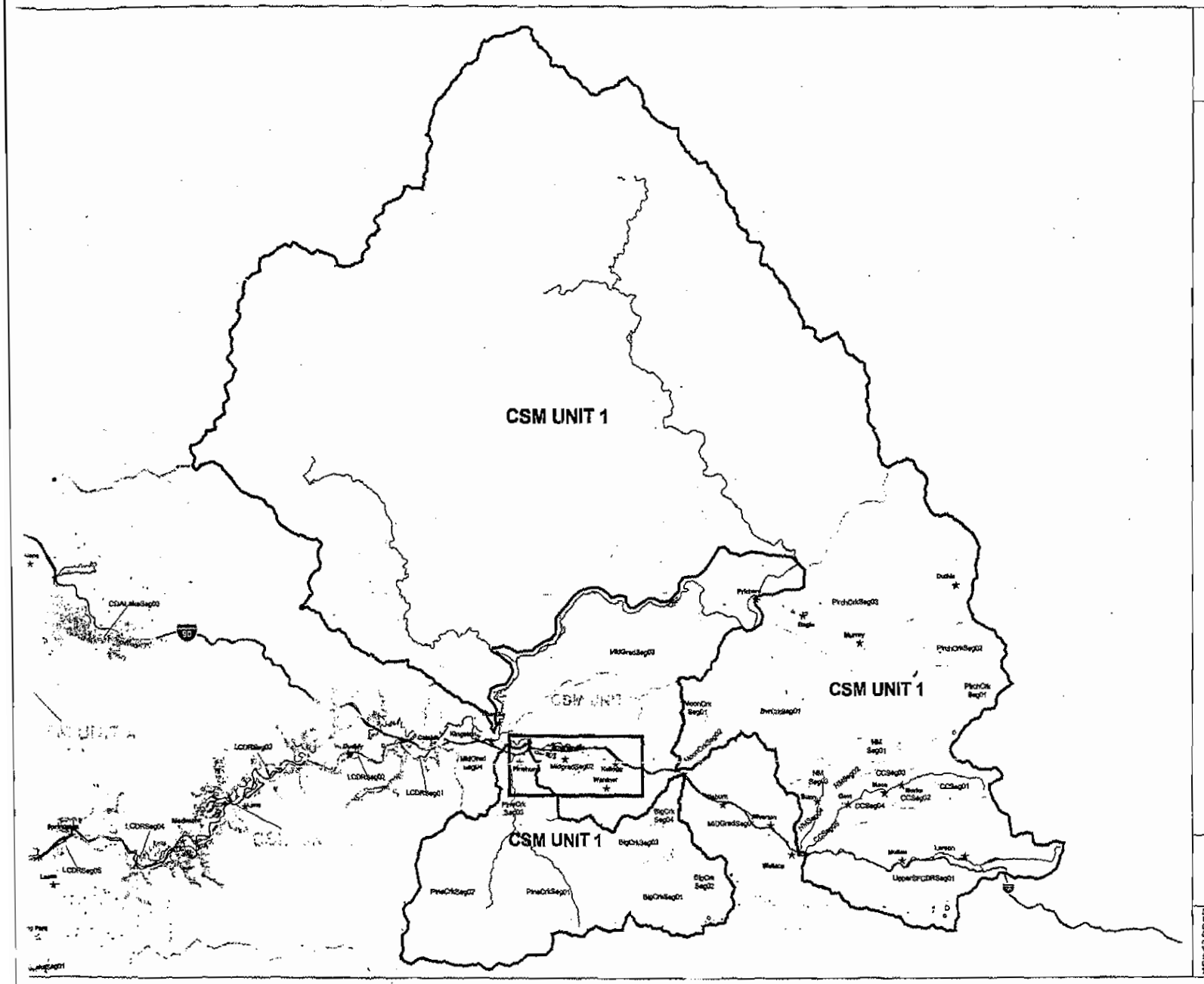
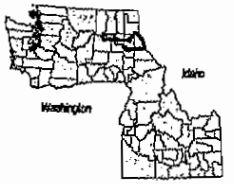


Figure 1.0-2
CSM Unit 1
Segment Boundaries

LEGEND

- City
- CSM Unit
- Bunker Hill Site Boundary
- Interstate 90
- Lakes and Rivers
- Segment Boundary



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 300,000

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Date of Plot: July 3, 2001

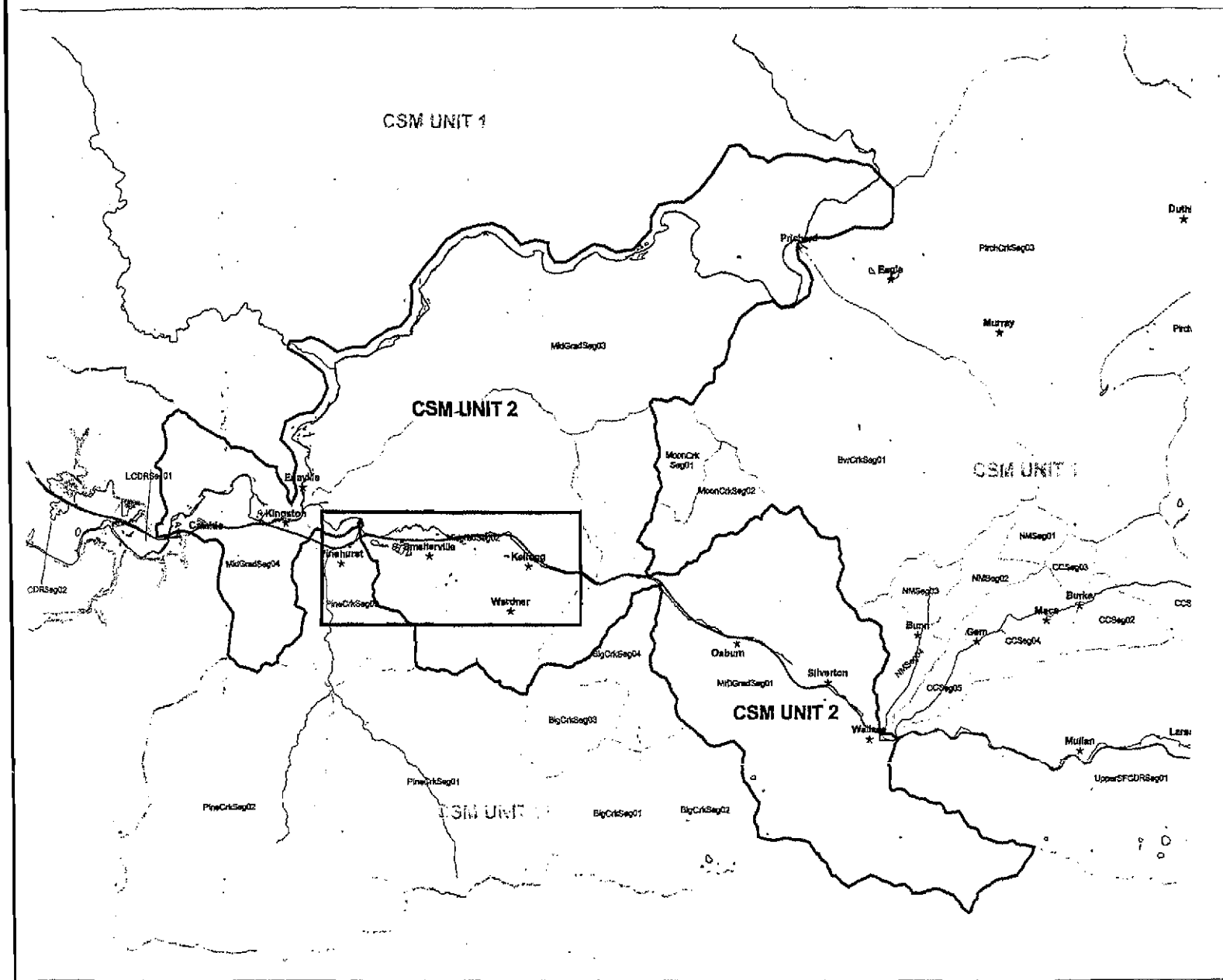
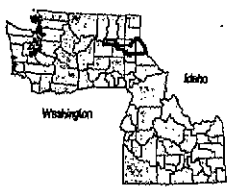


Figure 1.0-3
CSM Unit 2
Segment Boundaries

LEGEND

- City
- CSM Unit
- Bunker Hill Site Boundary
- Interstate 90
- Lakes and Rivers
- Segment Boundary



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 160,000

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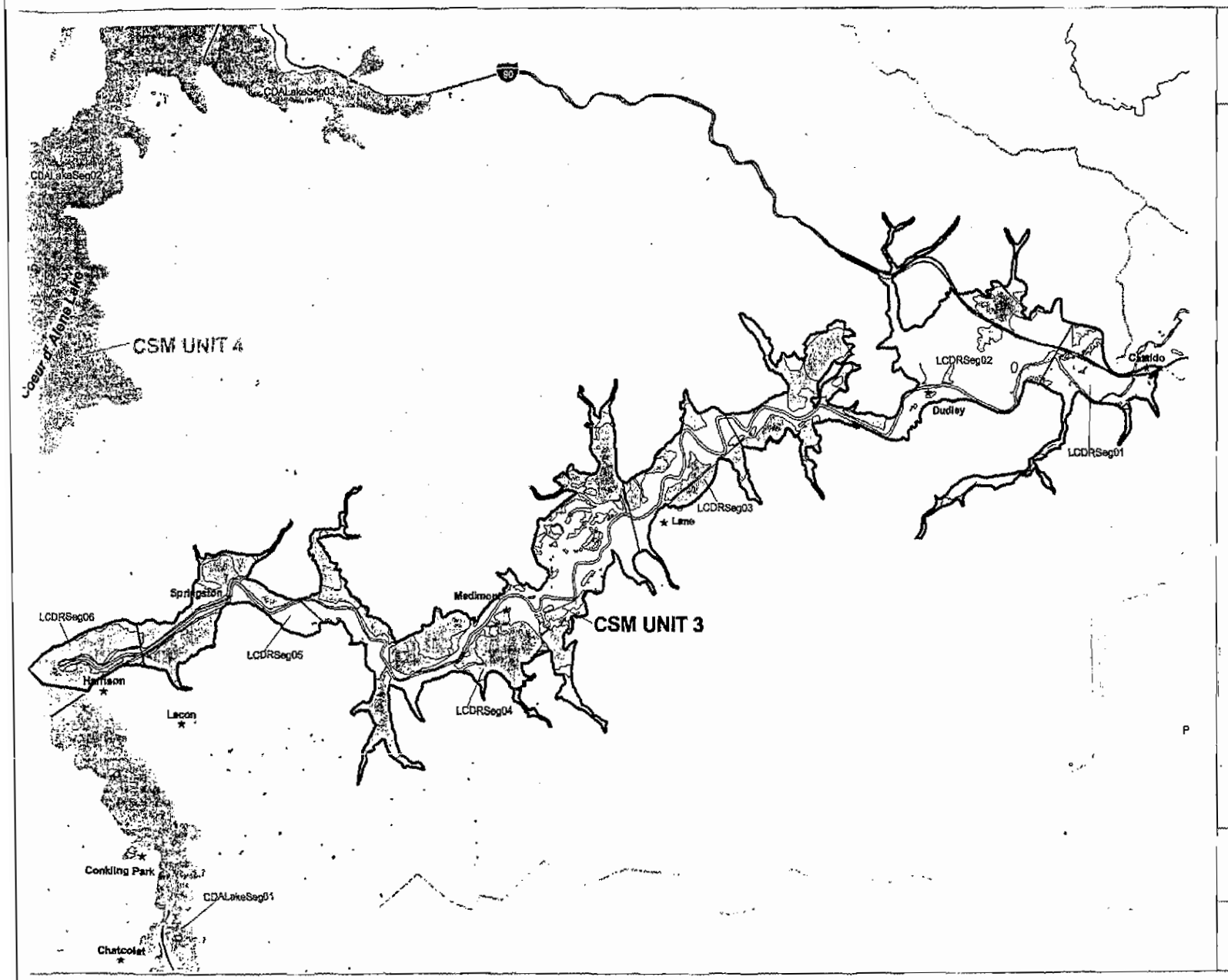

Figure 1.0-4
CSM Unit 3
Segment Boundaries

LEGEND

- City
- CSM Unit
- Interstate 90
- Lakes and Rivers
- Segment Boundary

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 120,000

0 2 Miles

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Date of Plot: JULY 3, 2001

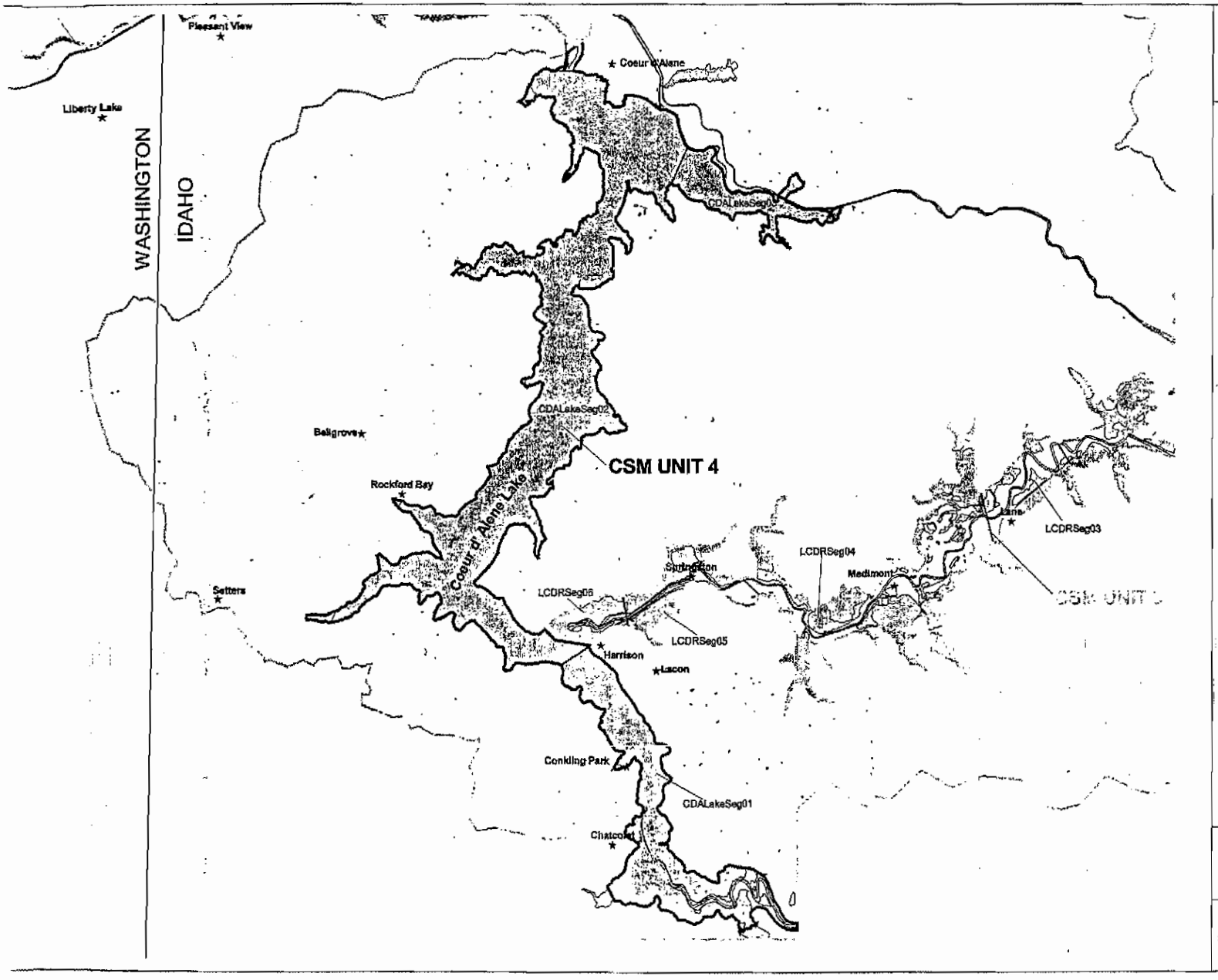
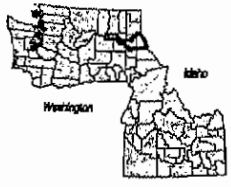


Figure 1.0-5
CSM Unit 4
Segment Boundaries

LEGEND

- City
- CSM Unit
- Interstate 90
- Lakes and Rivers
- Segment Boundary



Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 200,000

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Date of Plot: JULY 3, 2001

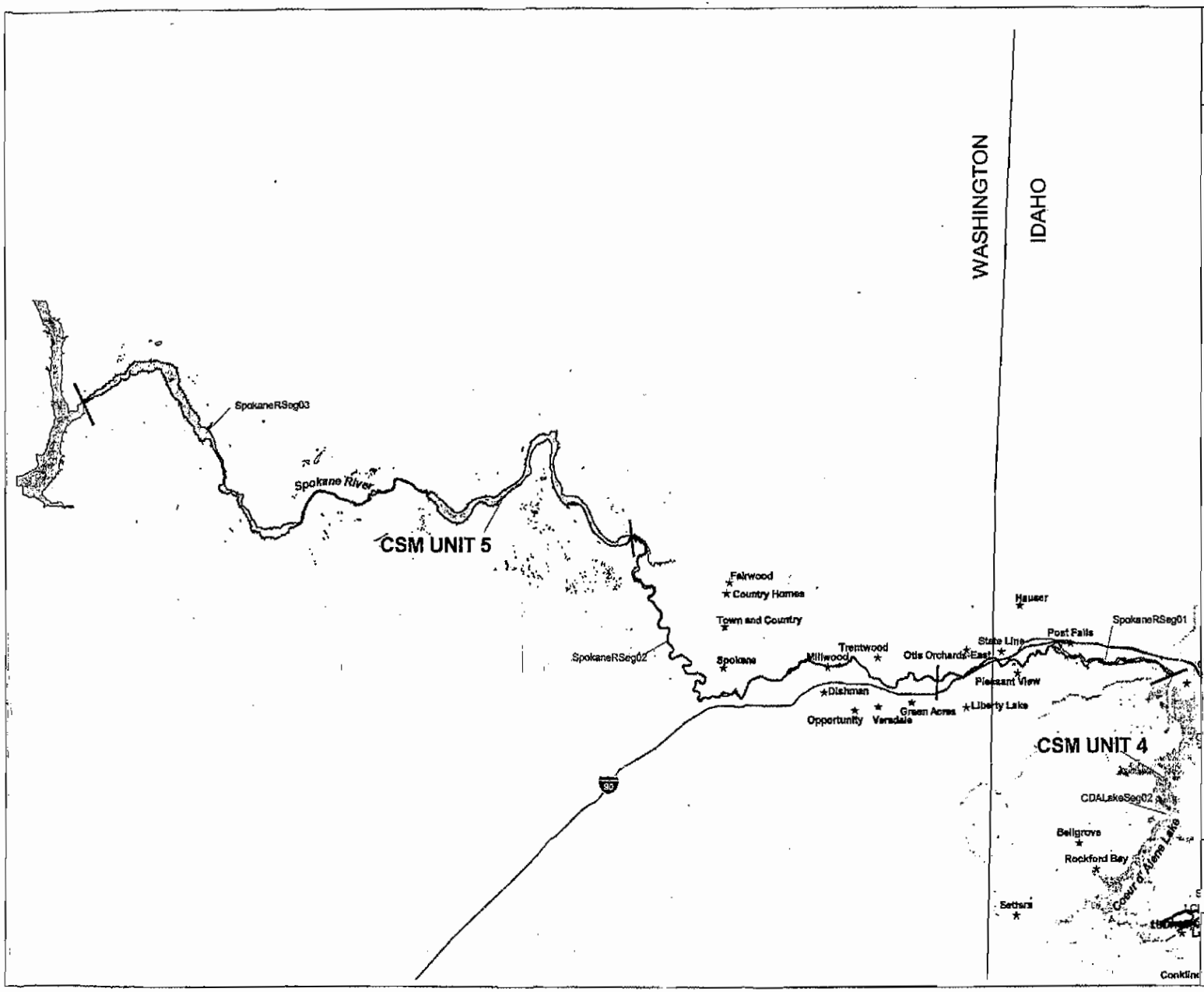

Figure 1.0-6
CSM Unit 5
Segment Boundaries

LEGEND

- City
- CSM Unit
- Interstate 90
- Lakes and Rivers
- Segment Boundary

Location Map

NOTES

1) Base map coverages obtained from the Coeur d' Alene Tribe, URS Greiner Inc., CH2M HILL, and the Bureau of Land Management.

SCALE 1: 470,000

0 5 Miles

N

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E: 5
L: CSM5 REMEDY
7/2001

This map is based on Idaho State Plane Coordinates West Zone, North American Datum 1983.

Date of Plot: August 6, 2000

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 MINING HISTORY

Mining within the Coeur d'Alene Basin began more than 100 years ago. The basin has been one of the leading silver, lead, and zinc-producing areas in the world, with production of approximately 1.2 billion ounces of silver, 8 million tons of lead, and 3.2 million tons of zinc (Long 1998). The region surrounding the South Fork has produced over 97 percent of the ore mined in the basin (SAIC 1993). The Bureau of Land Management (BLM) has identified nearly 900 mining or milling-related features in the region surrounding the South Fork (BLM 1999). Table 2.1-1 provides an overview of the history of milling and tailings disposal practices in the basin.

Mining-related activities generated hazardous substances including tailings (the part of the ore from which economical concentrations of metals cannot be recovered, usually 80 to 90 percent of the ore), waste rock (non-ore rock excavated from a mine), concentrates, and smelter emissions. In addition, the water that drains from many abandoned adits contains elevated levels of metals. These hazardous substances are the sources of metals contamination in the Basin.

Until 1968, most tailings were discharged directly into the South Fork or its tributaries. Since 1968, all tailings have been impounded or placed back in the mines. Current mining practices contribute relatively little to the 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. Table 2.1-2 summarizes the quantities of tailings and metals disposed by various methods.

Most of the tailings were transported downstream, particularly during high flow events, and deposited as lenses of tailings or as tailings/sediment mixtures in the bed, banks, floodplains, and lateral lakes of the Upper and Lower Basin 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 impacted materials (primarily sediments) exceeds 100 million tons dispersed over thousands of acres.

In addition to transport in water, mining wastes have also been distributed throughout the Basin as fill material for construction of roads, railroads, and structures and as airborne dust.

2.2 REGULATORY HISTORY

The following presents a history of CERCLA-related regulatory actions within the Basin.

- 1986, Idaho settles natural resource damages (NRD) claim against the mining companies for $4.5 million.

- May1994, EPA and Idaho enter into a consent decree with the mining companies for remedial work inside 21-square mile "Box."

- March 1996, the Department of Justice (DOJ), on behalf of EPA, U.S. Department of Agriculture, and U.S. Department of the Interior, files a complaint against the mining companies, seeking:

  - Declaration of mining company liability for response costs outside the BHSS
  - Payment of natural resource damages inside and outside the BHSS

- The case filed by DOJ is consolidated with a pending claim by Coeur d'Alene Tribe

- September 1997, EPA and ASARCO sign Administrative Order on Consent (AOC) for engineering evaluation/cost analysis (EE/CA) to examine use of wetland treatment systems to address mine adit discharge in Canyon Creek.

- March 1998, district court denies U.S. motion to add 23 potentially responsible parties (PRPs) as defendants in Coeur d'Alene Basin CERCLA litigation. PRPs include smaller mining companies as well as railroad companies and others.

- September 1999, in response to motion by ASARCO, district court rules that retroactive liability under CERCLA is not unconstitutional on its face, but may violate due process "as applied."

- March 2000, EPA, Forest Service, and ASARCO sign AOC for EE/CA at Jack Waite Mine Site in watershed of North Fork of Coeur d'Alene River.

- June 2000, 9th Circuit Court of Appeals vacates decision by district court that limited scope of NPL facility to 21-square-mile BHSS. Mining companies decline to seek further appeal. Decision leaves standing EPA position that NPL facility includes all areas of Coeur d'Alene Basin where mining contamination has come to be located.

- April 2000, EPA and Union Pacific Railroad sign AOC to initiate cleanup along 72-mile railroad right-of-way through Coeur d'Alene Basin.

- August 2000, district court approves consent decree among Union Pacific, State of Idaho, Coeur d'Alene Tribe, and United States for railroad right-of-way. $30 million settlement will provide for cleanup of mining contamination within right-of-way, and conversion of right-of-way for use as recreational trail, consistent with federal Rails-To-Trails Act. Trail will be operated by the State and Tribe and funded in perpetuity by Union Pacific.

- January 2001, district court approves consent decree among Sunshine Mining Company, U.S. and Tribe, after Sunshine filed for bankruptcy under Chapter 11. Based on Sunshine's limited ability to pay, settlement requires Sunshine to conduct limited removal actions on its own property, protect timber lands, and make payments to U.S. if metals prices rise substantially over present levels.

- January 22, 2001, trial begins in district court in Boise, Idaho, with ASARCO, Hecla, and Coeur as defendants. U.S. and Tribe present evidence of mining companies' liability under CERCLA and injury to natural resources.

- April 18, 2001, U.S. and Coeur file consent decree with district court, resolving CERCLA litigation against Coeur consistent with Coeur's limited ability to pay and limited contribution of contamination to Coeur d'Alene Basin. Consent decree requires Coeur to pay $3.8 million into fund to be allocated between EPA and federal trustees; to make additional payments if silver and gold prices rise substantially over present levels; to convey a 74-acre parcel of property that may be used for a local mine waste repository; and to conduct limited removal actions, with payment of EPA oversight costs.

- May 2001, settlement discussions continue with the two remaining defendants, Hecla and ASARCO, at trial in Boise.

2.3 PAST REMOVAL ACTIONS

Some of the most highly impacted source materials have been contained under CERCLA removal actions, in the Upper Basin, to reduce health and environmental risks. In addition, extensive remedial actions have been conducted within the BHSS in accordance with the OU 1 and OU 2 RODs for that area. These remedial actions are described in Section 3.0.

2.3.1 Human Health

Previous actions to protect human health have included intervention programs and removal actions. The Lead Health Intervention Program, run by the Panhandle Health District (PHD), provides personal health and hygiene information to help reduce exposure to metals. Services include educational programs, health monitoring programs, yard and home sampling, and nursing follow-up services.

The strategy for removal actions used in the Basin is consistent with the 1998 clarification (USEPA 1998) of the 1994 Lead Directive (USEPA 1994a) and has been peer-reviewed by the EPA Technical Review Workgroup for lead (TRW). A tiered response has been implemented based on a 1000 mg/kg to 2000 mg/kg lead threshold based on success in the BHSS. As an example of the effectiveness of the intervention and soil cleanup actions, blood lead levels in children have declined by 58 percent in Kellogg (from 10.8 to 4.5 micrograms per deciliter) since the inception of remedial activities within the BHSS in 1989. First actions are targeted at homes with a pregnant resident and homes where families have children 6 years and under. Schools, daycares, and other common areas typically used by children are also in the first tier of response. Soil removal actions had been conducted at a total of 61 residential yards through the end of year 2000. A summary of time-critical removal actions conducted to protect human health is presented in Table 2.3-1.

2.3.2 Ecological

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, the Silver Valley Natural Resource Trustees (SVNRT), a cooperative effort of the Idaho Department of Environmental Quality (IDEQ) and the mining companies, has conducted significant cleanup activities. Unfortunately, given the extensive contamination and number of sources present, these source-specific actions have not significantly reduced the metals loading to the Basin.

Most of the cleanup actions have focused on source areas within Canyon Creek, Ninemile Creek, Moon Creek, Pine Creek, and the South Fork Coeur d'Alene River in the Osburn area. Other minor actions have been conducted in the Upper South Fork watershed and in the lower Coeur d'Alene River and lateral lakes areas.

Table 2.1-1
History of Tailings Disposal Practices in the Coeur d'Alene Basin

Date	Milestone
1886	Processing of ore initiated using jigging.
1891	Six mills operating, with a total capacity of 2,000 tons per day
1901-1904	Construction of plank dams on Canyon Creek near Woodland Park and on the South Fork near Osburn and Pinehurst to control tailings movement. Large volumes of tailings accumulate behind the dams.
1905	Jig tailings from the Morning mill contained about 8% lead and 7% zinc.
1900-1915	Recovery of zinc initiated during this period. Previously, zinc was not recovered, and mills primarily processed low-zinc ores.
1906	Total milling capacity in the basin was 7,000 tons per day
1910	Flotation introduced in the basin at the Morning mill. Increased metals recoveries were achieved using flotation. Flotation tailings were finer grained than jig tailings and were transported greater distances by streams.
1917	Plank dams at Woodland Park and Osburn breached by flood waters.
1918	Flotation had been adopted at most mills by this time.
mid-1920s	Tailings observed in Spokane River.
1925	Flotation tailings from the Morning mill contained <1% each of lead and zinc.
1926-1928	Bunker Hill mills began placing tailings at Page Pond and the present-day location of the Central Impoundment Area.
1932	Dredging operations initiated in Lower Coeur d'Alene below Cataldo. Dredging continued until 1967. Dredge spoils were placed at Mission Flats.
1933	Plank dam near Pinehurst breached by flood waters.
1940-1942	Addition of 12 new mills with a combined capacity of 2,000 tons per day. Total milling capacity in the basin was 12,000 tons per day.
1940s	A portion of the tailings that had accumulated behind the Osburn and Woodland Park plank dams were reprocessed for metals recovery.
Late 1950s	Reuse of tailings as stope fill initiated.
1960s	Start of I-90 construction. Tailings from Mission Flats and Bunker Hill tailings pond used in embankment construction.
1968 to present	All tailings impounded or used as stope fill.

Table 2.1-2
Preliminary Estimate of Mill Tailings Produced in the Coeur d'Alene Mining District

Disposal Method[a]	Dates	Tailings (ton)	Metals Contained in Tailings (ton)		
			Silver	Lead	Zinc
To creeks	1884-1967	61,900,000	2,400	880,000	>720,000
To dumps	1901-1942	14,600,000	400	220,000	>320,000
Mine backfill	1949-1997	18,000,000	200	39,000	22,000
To impoundments	1928-1997	26,200,000	300	109,000	180,000
Total	1884-1997	120,700,000	3,300	1,248,000	>1,242,000

[a]Long (1998) defines dumps as unsecured stockpiles of tailings. Impoundments are secured by dams or other structures. Many impoundments were built over and from older tailings dumps.

Source: Long (1998)

Table 2.3-1
Removal Actions for Protection of Human Health by Year

Actions	1997	1998	1999	2000	Total to Date
Residential yards	7	10	23	21[a]	61
Schools/daycares	1[b]	-	3	2	6
Recreational areas	-	-	4	1	5
Educational signage	-	-	9	-	9
Bottled water	-	-	10	1	11
End of tap water treatment	-	-	4	1	5
Municipal water hookup	-	-	6	-	6
Cubic yards of contaminated soil removed	1,935	1,500	20,000	12,000	35,465
Cost	$149,000	$187,252	$2,274,243	$1,200,000	$3.8M

[a] 2000 yard tally includes 20 residential properties and 1 trailer park. Also, 2 homes with exterior lead-based paint were pressure-washed prior to removal of the contaminated soil.
[b] Silver Hills Middle School was started in 1997 and completed in 1998 due to extremely large size and coordination with school schedules.

3.0 SCOPE AND ROLE OF RESPONSE ACTION

The site has been divided into four operable units: the populated areas of the BHSS (OU 1); the non-populated areas of the BHSS (OU 2); the discharge of acid mine drainage from the Bunker Hill mine (OU 3); and mining-related contamination in the broader Coeur d'Alene River Basin (OU 4). The action currently under review by the NRRB is primarily focused on OU 4. A brief summary of the four operable units is provided below.

Records of Decision (RODs) have been signed for OU 1 (in 1991) and OU 2 (in 1992). An RI/FS was initiated for OU 3 in 1998 to address the long-term management of acid mine drainage (AMD) from the Bunker Hill mine. The RI/FS was released in April 2001, and the proposed plan is scheduled for release in July 2001. Also in 1998, EPA initiated an RI/FS for OU 4. Draft versions of the RI and FS were released for public comment in 2000.

3.1 OPERABLE UNIT 1

The populated area operable unit of the BHSS (OU 1) includes residential and commercial properties, right-of-ways (ROWs), and public use areas in the towns of Kellogg, Wardner, Smelterville, Pinehurst, and several smaller unincorporated communities. Cleanup activities began in OU 1 as this was the area of greatest concern for human health exposure. In 1985, a Lead Health Intervention Program (LHIP) was initiated by the Centers for Disease Control and the Agency for Toxics Substances and Disease Registry (ATSDR) to minimize blood lead levels in children through health education, parental awareness, and biological monitoring. The program is ongoing to date and is administered by the local Panhandle Health District under the Idaho Department of Health and Welfare.

In 1986, some city parks and school playgrounds were cleaned up as part of a CERCLA removal action. The yard soil removal program was initiated in 1989 as a CERCLA time critical removal action to replace contaminated soils in yards of young children at highest risk of lead poisoning. Since 1994, the yard soil removal program has been implemented by the potentially responsible parties (PRPs) pursuant to the 1991 populated area ROD. The PRPs are scheduled to remediate 200 residential parcels each year until all yards, commercial properties, and ROWs with lead contaminated soils greater than or equal to 1,000 parts per million (ppm) have been remediated to achieve a community-wide average of 350 ppm lead. Completion of remedial activities in the populated area is expected by 2003.

House dust, long recognized as a primary source of lead exposure among children, is being monitored through the LHIP. Should house dust lead levels remain elevated following completion of remediation, homes with dust lead concentrations greater that 1,000 ppm will be

evaluated for interior remediation. A five-year review of OU 1 was completed in 2000. The review document further describes OU 1 cleanup activities.

3.2 OPERABLE UNIT 2

The non-populated area operable unit of the BHSS (OU 2) includes the former industrial complex and mine operations area, river flood plain, hillsides, various creeks and gulches, site surface water and ground water, and the Central Impoundment Area (CIA). Site PRPs performed various removal activities pursuant to several orders prior to the 1992 ROD, including smelter stabilization efforts from 1989 to 1993, and hillsides revegetation and fugitive dust control efforts from 1990 to 1992.

Following completion of the ROD in 1992, five PRPs signed a Consent Decree with EPA to perform cleanup activities in limited areas of OU 2, including the Union Pacific Railroad right-of-way (UPRR), the A-4 gypsum pond (Stauffer Chemical), and the Page Pond tailings repository. In 1995, EPA and the State of Idaho entered into a State Superfund Contract to perform the remaining site remedial actions. Cleanup actions addressed in the ROD included a series of source removals, surface capping, reconstruction of surface water creeks, demolition of abandoned milling and processing facilities, engineered closures for waste consolidated on site, revegetation efforts, and surface water and groundwater controls and treatment in a constructed wetlands treatment system. There has been one ROD amendment (September 1996) and two Explanation of Significant Differences (January 1996 and April 1998) since the ROD was completed in 1992. A five-year review of OU 2 was completed in 2000. The review document further describes OU 2 cleanup activities.

In the State Superfund Contract, EPA and the State of Idaho agreed to a two-phased site implementation strategy. Phase I largely addresses source removals aimed at consolidating extensive contamination from various areas of the Site. Phase I cleanup activities are estimated to be mostly complete in 2001. Phase II will address site surface water and groundwater cleanup and will be implemented following completion of source control and removal activities and evaluation of the effectiveness of these activities in meeting water quality improvement objectives.

3.3 OPERABLE UNIT 3

At the time the non-populated areas ROD was written in 1992, the CTP was under private ownership and was anticipated to so remain. The ROD, therefore, did not address control of AMD from the Bunker Hill Mine, or operation of the CTP, in any significant way. It briefly addressed the mine water by requiring that it continue to be treated in the CTP prior to discharge to a wetlands treatment system for removal of residual metals. The wetlands treatment system, as noted above, was found to be unreliable on a year round basis.

The 1992 ROD did not contain or otherwise identify any plans for the control or long-term management of the mine water. Subsequent to the ROD, some measures were taken to reduce mine water flows. Between December 1994 and February 1995, the New Bunker Hill Mining Company (NBHMC, the current mine owner/operator) plugged 72 drill holes within the mine that were discharging water. They also placed a concrete bottom in the reservoir behind the Bunker Hill Dam in mainstem Milo Creek. This was done to reduce leakage to underlying mine workings. In 1998 and 1999, a water diversion project was implemented on the mainstem of Milo Creek. The purpose of the project was to minimize contact between Milo Creek surface water and tailings/waste rock on the valley floor, and to reduce infiltration into the mine workings underlying that stretch of Milo Creek. Although, to date, the effectiveness of these measures to reduce infiltration cannot be determined, it is believed that AMD flows, and particularly the seasonal peak flows, can be significantly reduced by additional measures.

The ROD also did not address the long-term management of treatment residuals (sludge) from the CTP, which are currently pumped into an unlined pond on the CIA. At current disposal rates it is estimated that the pond will be filled in 3 to 5 years. In addition, the 1992 ROD acknowledged that development of a total maximum daily load (TMDL) for the South Fork, as required by the Clean Water Act, was being considered. At the time of the ROD, however, the TMDL was not developed.

In September 1996, the United State District Court for the Western District of Washington ordered EPA and the State of Idaho to develop a schedule for completion of TMDLs for all water quality impaired streams earlier identified by the state, including the Coeur d'Alene River Basin. TMDL development was initiated in 1998. In August 2000, a TMDL for dissolved cadmium, lead, and zinc in surface waters of the Basin was jointly released by EPA and the State of Idaho.

In February 1998, EPA and the Idaho Department of Environmental Quality (IDEQ) released a jointly-prepared memorandum that described additional considerations for the long-term management of the mine water at the Bunker Hill site. The joint memorandum identified the need to begin further evaluations for long-term mine water management, including achievement of the TMDL and long-term sludge disposal. With this memorandum, IDEQ and EPA jointly initiated the RI/FS process for OU 3. A joint work group including representatives from EPA, IDEQ, contractors for both agencies, and the NBHMC worked together in developing the RI/FS, which was released in 2001. The Proposed Plan for OU 3 in under development and the start of the public comment period is expected in late summer or fall 2001.

3.4 OPERABLE UNIT 4

At the time the 1992 non-populated areas ROD was written it was widely recognized that: mining related contamination in North Idaho was not limited to the areas surrounding the BHSS. Actions selected in the ROD did not address sources of contamination upgradient of the BHSS, and while selected actions were expected to have significant benefits over time to downgradient

water quality, active remediation of the South Fork was beyond the scope of the ROD. To address these and other contamination and water quality issues in the broader Coeur d'Alene Basin, the EPA, State of Idaho, the Coeur d'Alene Tribe and other federal, state and local agencies formed the Coeur d'Alene Basin Restoration Project. The purpose of this project was to integrate water quality improvement programs in the Basin through coordination of the federal regulatory authorities under the Clean Water Act, CERCLA, and RCRA, and other state, local, and tribal programs.

The first comprehensive study of human health effects outside of the BHSS was conducted in 1996 by the State of Idaho. Approximately 15 percent of children (under 10 years of age) in the Silver Valley were tested in 1996 and 1998 and found to have lead levels above EPA's 10 µg/dl level of concern. Within the BHSS, which had been partially remediated at this time, 12 percent were above the level of concern. In 1998, EPA initiated a RI/FS for the Coeur d'Alene Basin.

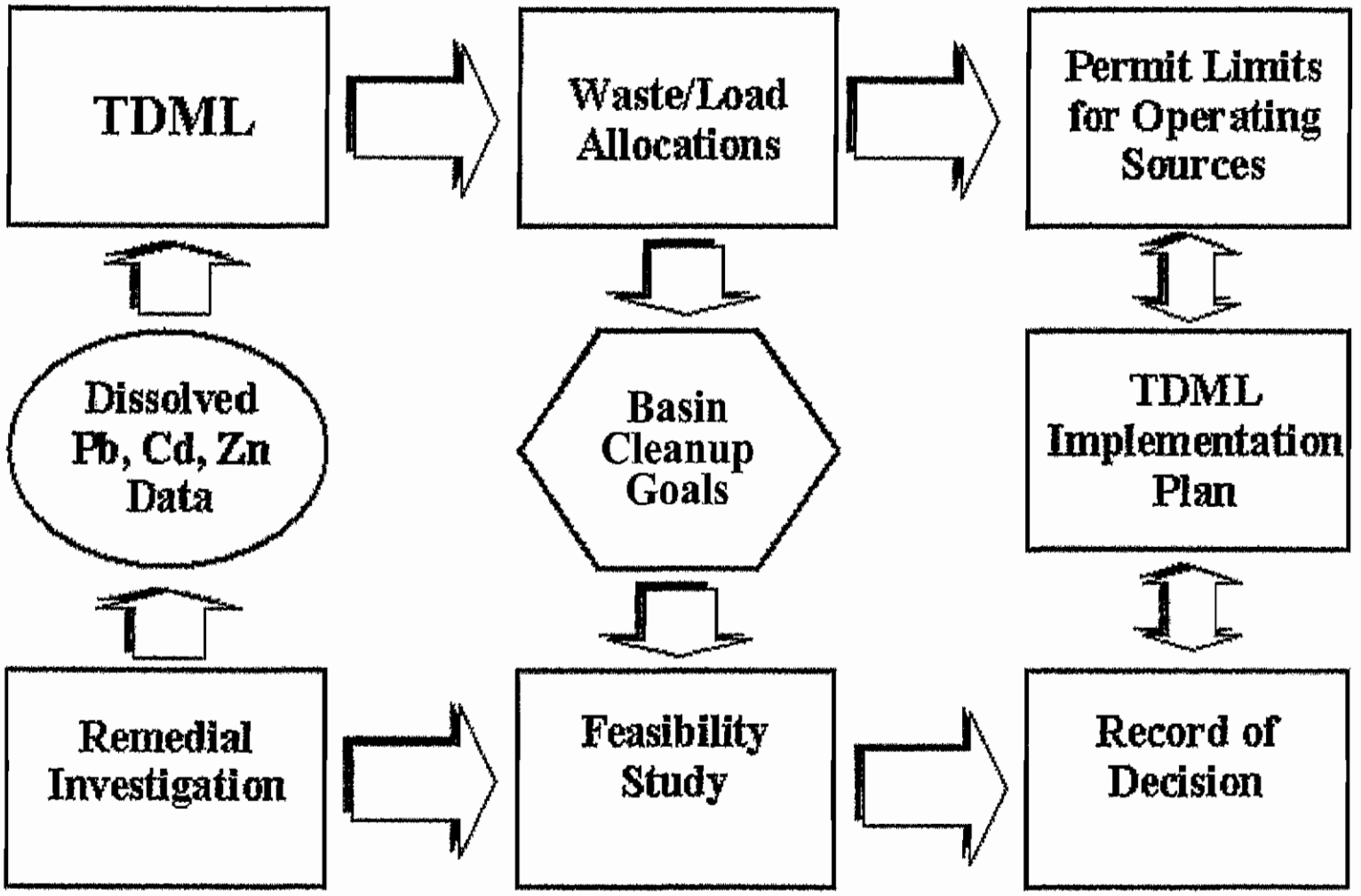
The BHSS is located within the area being investigated as part of the of the Basin project. The remedial actions conducted within the non-populated areas of the Site are being reviewed and considered in the Basin RI/FS process. For example, an evaluation of metals loading from all sources in the Basin, including the non-populated areas (OU 2), is included in the RI/FS. It is possible that additional cleanup actions in the non-populated area may need to be considered if determined necessary to meet overall cleanup goals for the Basin. It is also possible that cleanup technologies and strategies being considered for the Bunker Hill mine water, such as water treatment and sludge management, may be similar or compatible with those considered for the Basin. This overlap may provide opportunities that benefit cleanup in both OUs.

3.5 TOTAL MAXIMUM DAILY LOADS (TMDLS)

As described in Section 3.3, TMDL load allocations have been developed for the Coeur d'Alene Basin. Sources from OUs 2, 3, and 4 and, to a lesser degree, OU 1 contribute to the metals load in the Basin.

The CERCLA process and TMDLs are complementary, as shown in Figure 3.5-1. The RI provided data to the TMDL for developing source load allocations. In the Basin, an estimated 8 percent of the total load is derived from discrete sources (e.g., operating mines, adit discharges, sewage treatment plants), and an estimated 92 percent of the total load is derived from non-discrete sources. Figure 3.5-2 shows the load sources. The load sources are used as the basis for waste load allocations, which are translated into NPDES permit limits for operating sources.

The gross load allocations by river segment serve as guidelines for the Basin remedy, along with other ARARs and human health and ecological risk-based goals. In the Basin, gross load allocations have been established at the mouth of Canyon Creek, the mouth of Ninemile Creek, the South Fork at Wallace, the mouth of Pine Creek, the South Fork and North Fork just above their confluence, the Coeur d'Alene River where it empties into Coeur d'Alene Lake, and the Spokane River at the Idaho-Washington border.

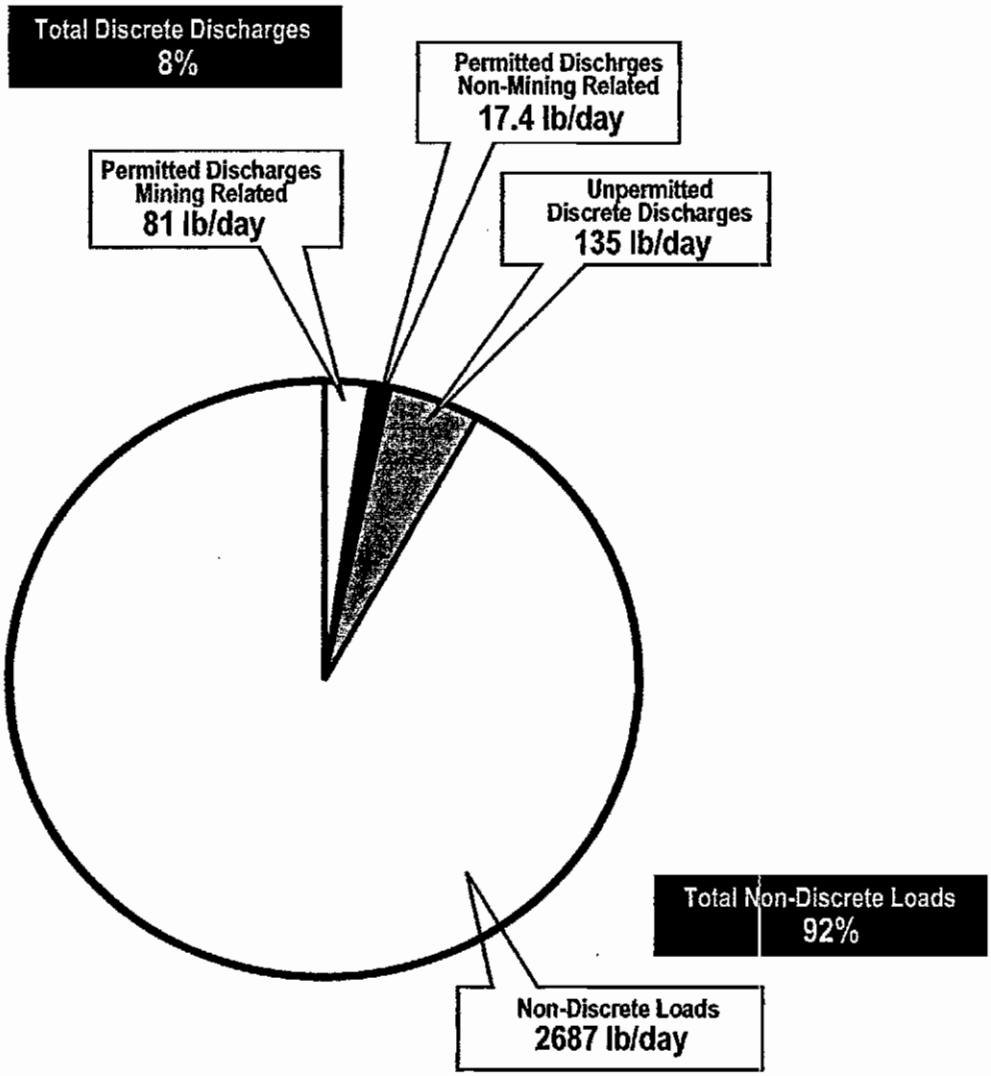


EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
REMEDY REVIEW BOARD

RRB18

Figure 3.5-1
CERCLA and CWA Integration in the Coeur d'Alene Basin



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	RRB6	**Figure 3.5-2** **Discrete and Non-Discrete Sources of Dissolved Zinc Load in the South Fork**

4.0 SITE CHARACTERISTICS

4.1 GEOGRAPHY

The Coeur d'Alene Basin, as defined for the RI/FS, extends from the Idaho-Montana border in the Bitterroot Mountains west to the confluence of the Spokane River and the Columbia River at Roosevelt Lake. The Coeur d'Alene Basin RI/FS includes the Coeur d'Alene River Basin, Coeur d'Alene Lake, and the Spokane River. The Coeur d'Alene River Basin encompasses approximately 1,475 square miles (3,800 square kilometers).

To facilitate evaluation of risks and remedial alternatives, the Basin was divided into five conceptual site model (CSM) units that are differentiated based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes. The five CSM units are:

- CSM Units 1 and 2, Upper Basin (Figures 1.0-2 and 1.0-3)
- CSM Unit 3, Lower Basin (Figure 1.0-4)
- CSM Unit 4, Coeur d'Alene Lake (Figure 1.0-5)
- CSM Unit 5, Spokane River (Figure 1.0-6)

The CSMs are described in further detail in Section 4.1.2.

Based on the results of the RI (URSG and CH2M HILL 2000b), the human health risk assessment (TerraGraphics and URSG 2000), and the ecological risk assessment (URSG and CH2M HILL 2000a), the FS study area focused on the areas with the greatest human health and ecological risks. The study areas for development of human health and ecological alternatives are organized differently , and are defined in the following sections.

4.1.1 Geographical Organization of the Human Health Alternatives

For development of human health alternatives, eight major areas were identified based on projected human exposure scenarios and public use patterns (Von Lindern 2000b). These areas differ from the CSM Units because prior analyses showed that not all portions of the CSM Units were a concern to human health (URSG 1999). In addition, human exposure in several areas crossed over CSM Unit boundaries or only included portions of CSM Units. Therefore, for the purpose of evaluating human health risk and potential remediation requirements, it was necessary to redefine study areas based upon human health exposure. Figure 4.1-1 shows these eight investigation areas. Specifically, they are:

- **Mullan** includes the town of Mullan and the uppermost portion of the South Fork of the Coeur d'Alene River and its tributaries, from Wallace to the headwaters of the river.

- **Burke/Ninemile** (includes Canyon Creek) includes the Canyon Creek and Ninemile Creek tributaries of the South Fork watershed, excluding the upper reaches of Canyon Creek. Communities along Canyon Creek include Frisco, Burke, Mace, Cornwall, Yellow Dog, Black Bear, Gem, and Woodland Park. Ninemile Creek communities include Black Cloud, Day Rock, McCarthy, and Zanettiville.

- **Wallace** includes the town of Wallace, which is located in the canyon of the South Fork of the Coeur d'Alene River at the river's confluence with Canyon, Ninemile, and Placer Creeks.

- **Silverton** includes the town of Silverton, which lies along Interstate 90 between Osburn and Wallace.

- **Osburn** includes the town of Osburn and the small community of Polaris, which are located immediately south of Interstate 90 and the Coeur d'Alene River.

  Side Gulches includes Moon Creek and Gulch, a portion of the South Fork watershed, and residential areas of the Big Creek watershed. Montgomery, Nuckols, and Terror Gulches are also included, as well as Sunny Slopes, Twomile, and Elk Creek.

  Kingston includes the towns of Kingston and Cataldo, portions of the Pine Creek watershed, and portions of the South Fork and North Fork watersheds. Residences along a portion of the Pine Creek watershed are included in the Bunker Hill area and are not included in the Kingston area.

- **Lower Basin** includes all of the Coeur d'Alene River west of Cataldo to Harrison, at the mouth of Lake Coeur d'Alene.

4.1.2 Geographical Organization of the Ecological Alternatives

For development of ecological alternatives, four areas were identified based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes: the Upper Basin (CSM Units 1 and 2); the Lower Basin (CSM Unit 3); Coeur d'Alene Lake (CSM Unit 4); and the Spokane River (CSM Unit 5). These areas are shown on Figures 1.0-2 through 1.0-6.

Upper Basin encompasses the steep mountain canyons of the South Fork and its tributary gulches. The Upper Basin is the source area for most of the mining-related waste materials, and includes the Canyon Creek, Ninemile Creek, Big Creek, Moon Creek, and Pine Creek tributary watersheds. The upper basin drains an area of 300 square miles. The channel and riparian zone of the South Fork and certain of its tributaries have undergone extensive channelization and other alterations as a result of mining-related activities and other anthropogenic activities, including the construction of the I-90 freeway.

Lower Basin includes the lateral lakes and extensive floodplain wetlands. For alternative development, the study area is limited to the 100-year floodplain. Below Cataldo, the river flows into a broad, flat valley and takes on a meandering, depositional character with a fine sediment bottom. Much of the tailings released to streams in the Upper Basin were transported to and deposited within the Lower Basin, largely during flood events. From Rose Lake downstream, the river surface elevation is controlled by Post Falls Dam on the Spokane River near the outlet from Coeur d'Alene Lake.

Coeur d'Alene Lake encompasses 49.8 square miles at full pool elevation (2128 feet above sea level), with a maximum water depth of 209 feet. Its principal tributaries are the St. Joe's River and the Coeur d'Alene River. The lake has a drainage area of 3,741 square miles. The discharge from the lake forms the Spokane River. The lake's elevation is controlled by the Post Falls Dam. The lake is classified as oligotrophic.

Spokane River flows from Coeur d'Alene Lake and is dammed at six locations above its terminus at Lake Roosevelt. For alternative development, the study area is limited to depositional areas identified by the Washington Department of Ecology (Ecology) between the Washington-Idaho state line and Upriver Dam. Within the study area, the river bed primarily consists of coarse gravel and cobbles, and the floodplain and riparian zone are relatively narrow. The Washington State Department of Ecology (Ecology), EPA, and the Spokane Tribe are continuing to evaluate the river downstream of Upriver Dam, and the need for actions in these areas will be considered in the future.

The site was further subdivided into watersheds, segments, and sources. The Upper Basin includes tributary watersheds that are sources of mining-related contamination. These tributary watersheds are the Upper South Fork, Canyon Creek, Ninemile Creek, Big Creek, Moon Creek, and Pine Creek watersheds. The watersheds were further subdivided into one or more segments based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes. Finally, individual mining-related source areas were identified based on mapping conducted by the U.S. Bureau of Land Management. The source areas are located in the Upper Basin.

4.2 NATURE AND EXTENT OF CONTAMINATION

4.2.1 Nature and Extent of Contamination with Respect to Human Health

As a result of natural dispersion processes, high concentrations of metals in mine tailings, mine waste, and mine drainage have been transported to adjacent groundwater, surface water, sediment, soil, and dust. The primary media of concern for human health are:

- Contaminated soil in home yards, street rights-of-way, abandoned and active commercial and undeveloped properties, and common areas, and airborne dust generated at these locations
- Contaminated house dust, originating primarily from contaminated soil
- Drinking water from local wells or surface water
- Contaminated fish
- Homegrown vegetables

People in the Basin can be exposed to contaminants of potential concern by ingesting soil, breathing dust, drinking water, and eating contaminated fish or homegrown vegetables. The contaminants of potential concern are:

- Seven metals in soil: antimony, arsenic, cadmium, iron, lead, manganese, and zinc
- Seven metals in house dust: antimony, arsenic, cadmium, iron, lead, manganese, and zinc
- Five metals in groundwater: antimony, arsenic, cadmium, lead, and zinc
- Five metals in surface water: arsenic, cadmium, lead, manganese, and mercury
- Two metals in tap water: lead and arsenic

Although fish and vegetables were not screened for COPCs, indicator metals were selected for these based on toxicity and presence in the Basin. The selected indicator metals for fish consumption were cadmium, lead, and mercury, and for vegetables were arsenic, cadmium, and lead. Although not considered a primary medium of concern in the HHRA, problem with interior lead-based paint were considered to be a contributor to lead concentrations children's blood in about 30 percent of the cases where the blood lead level exceeded 10 µg/dl. These are important sources that are addressed on a case-by-case basis.

Exposures to lead in soil and dust from the home and surrounding communities are the primary human health concerns in the Basin. Figures 4.2-1 and 4.2-2 show lead concentrations in yard soil and house dust in the eight community areas investigated.

The actual quantities of waste removed, contained, or treated would vary depending on the remedial approach. For the human health alternatives, quantities are summarized in terms of number of residences exceeding cleanup levels for each of the primary potential exposure media. The estimated number of residences with lead in yard soil at concentrations exceeding PRGs of 700 mg/kg and 1,000 mg/kg are shown in Table 4.2-1. Although groundwater contamination is observed in the Basin, an insufficient number of monitoring wells have been installed to identify plumes and isoconcentration contours. The estimated numbers of residences with drinking water containing metals at concentrations exceeding one or more maximum contaminant levels (MCLs) are shown in Table 4.2-2. Estimated numbers of residences with house dust containing lead at concentrations exceeding potential thresholds are shown in Table 4.2-3.

Soil, sediment, and surface water are impacted at beaches and recreational areas. Figure 4.2-3 shows an overview of sediment, soil, and surface water impacts at selected river and stream locations in the Basin. Figure 4.2-4 shows graphically the widespread distribution of lead concentrations above EPA's emergency action level (2,000 mg/kg) for protection of human health in soil and sediment samples in the Basin. The figure shows four concentration ranges:

- 0 to 175 mg/kg (175 mg/kg equals the 90 percent upper confidence interval of the background lead concentration)
- 175 mg/kg to 500 mg/kg
- 500 mg/kg to 2,000 mg/kg
- Greater than 2,000 mg/kg

4.2.2 Nature and Extent of Contamination with Respect to Ecological Receptors

Contaminated media that potentially affect ecological receptors are surface water, soil, and sediment. In addition, groundwater is important as a pathway for migration of metals to surface water. The primary metals of concern for ecological protection are cadmium, lead, and zinc.

To help characterize the nature and extent of contamination and to develop remedial alternatives, the contaminated media were grouped by "source type" in the FS. These sources types are based on the mining-related primary sources (tailings, waste rock, and adit drainage) and the secondary sources, or impacted media (floodplain sediments, river banks and beds, wetlands, lateral lakes, dredge spoils, and lake bottom sediments) present in the Basin. To provide a perspective on the

volumes of source types which need to be addressed, Table 4.2-4 presents an overview of the volume of impacted materials in the Basin.

In the Upper Basin (CSM Units 1 and 2), metals-impacted sediments in the current and historic 100-year floodplain are the major sources of metals in the streams and river. An estimated 7 million cubic yards (cy) of impacted sediments are present. However, an estimated 3 million cubic yards (cy) of these sediments are potentially inaccessible for excavation because they are beneath the I-90 embankment, other roads, or residential or commercial structures. These sediments still represent a metals loading to the Basin as they are subject to leaching by groundwater with subsequent discharge into surface waters. A total of nearly 3,000 acres of the Upper Basin have been disturbed by mining activities.

In the Lower Basin, erosion of stream banks is a major source of metals, particularly lead, into the Coeur d'Alene River. There are an estimated 1.8 million cy of impacted bank materials subject to erosion. Downstream wetlands, 100-year floodplains, and lateral lake sediments are the major source of metals ingested by waterfowl and other animals. There are about 13,000 acres of these sediments that contain more than 1,000 mg/kg of lead. The area containing more than 1,000 mg/kg of lead represents 72% of the 18,000 acres of floodplain habitat present in the Lower Basin.[2] The Lower Basin includes the Cataldo/Mission Flats area, where tailings were dredged from the river and placed within the 100-year floodplain. An estimated 13 million 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 approximately 75 million metric tons of contaminated sediments at the bottom of the lake. Studies by the USGS indicate that under current lake conditions, there is some movement of the metals from the sediment into the water column in the dissolved phase; however, the currently available data indicate that the lake acts as a sink for metals discharged from the Coeur d'Alene River. Table 4.2-5 shows the net retention of metals in the lake, where retention is the difference between the metal load into the lake and the load out of the lake, expressed as a percentage of the load into the lake. Cadmium retention ranged from 47 to 56 percent and averaged 52 percent. Lead retention ranged from 82 to 92 percent and averaged 89 percent. Zinc retention ranged from 31 to 43 percent and averaged 38 percent.

Estimated average metals concentrations and loads (the amount of metal transported in a stream, in pounds per day) were calculated from all surface water data collected from 1991 to 1999. The Upper Basin is the primary source of dissolved zinc in the river system. The estimated average dissolved zinc load in the South Fork just above the confluence with the North Fork (South Fork at Pinehurst) is about 79 percent of the load that discharges to the lake (Lower Coeur d'Alene at Harrison). Zinc (Figure 4.2-5) is present primarily in the dissolved form in surface water and

[2] Estimates of remediation areas and associated costs are based on a lead concentration of 1,000 mg/kg. The chronic effects remediation goal for waterfowl is 500 mg/kg. The difference in remediation areas based on 500 and 1,000 mg/kg lead is small, and less than the contingency included in the cost estimate.

occurs largely as a result of infiltration of groundwater contaminated by tailings-impacted sediments into surface water. 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.

The Lower Basin is the primary source of total lead in the river system. The increase in total lead load below the confluence of the North and South Forks is about 1,090 pounds per day, or about 72 percent of the load that discharges to the lake. Lead (Figure 4.2-6) tends to bind more strongly to soil particles than zinc does, and the lead load is largely due to erosion of soil and sediment, particularly during high flow periods.

Relatively little of the dissolved metals in the river system come from discrete sources. Discrete sources include mining-related NPDES-permitted discharges (including the treatment plant for the Bunker Hill mine water discharge), non-mining-related NPDES-permitted discharges, and unpermitted discrete discharges (adit and seep discharges). The estimated loads from the discrete discharges account for only about 8 percent of the estimated dissolved zinc load and about 3 percent of the total lead load in the South Fork at Pinehurst (Figure 3.5-2).

Groundwater associated with the impacted sediments in the valley fill aquifers of the Upper Basin is the primary source of dissolved metals loading in the river and streams. Surface and groundwater percolates through the tailings-impacted sediments and dissolves metals. The water discharges into the streams and rivers, carrying the dissolved metal load with it. Metals loading is enhanced by the relatively large degree of surface water/groundwater interaction that occurs in some parts of the Upper Basin. In areas where the valley floor widens, streams lose water to the valley fill aquifer ("losing reach"). In areas where the valley floor constricts, groundwater discharges back into the streams ("gaining reach"), carrying additional metals load. The USGS studied the surface water/groundwater interaction (Barton 1999). Figures 4.2-7 and 4.2-8 show the results of the studies in lower Canyon Creek and the South Fork within the BHSS in September 1999. These studies confirm that most of the dissolved zinc load in the study areas was gained by the streams in the gaining reaches.

Elevated levels of metals are present in Spokane River sediments. Figures 4.2-9, 4.2-10, and 4.2-11 present concentrations of cadmium, lead, and zinc, respectively, measured in 63 sediment samples. Based on these data, about 25% of samples contained cadmium above the upper background concentration, about 82% of samples contained lead above the upper background concentration, and about 90% of samples contained zinc above the upper background concentration. Because there are relatively few depositional areas along the Spokane River, the volume of contaminated sediments is small compared to the Upper Basin and Lower Basin. An estimated volume of 260,000 cy of contaminated sediments are present upstream of Upriver Dam. Additional contaminated sediments are present downstream of Upriver Dam, but have not been quantified.

Surface water in Coeur d'Alene Lake and the Spokane River has been impacted by metals. The water in the Lake exceeds the water quality standards for cadmium and zinc and intermittently

for lead. In samples from the Spokane River analyzed for the RI, 21% contained cadmium exceeding a screening level of 0.9 µg/L, 48% contained lead exceeding a screening level of 0.66 µg/L, and 68% contained zinc exceeding a screening level of 30 µg/L.

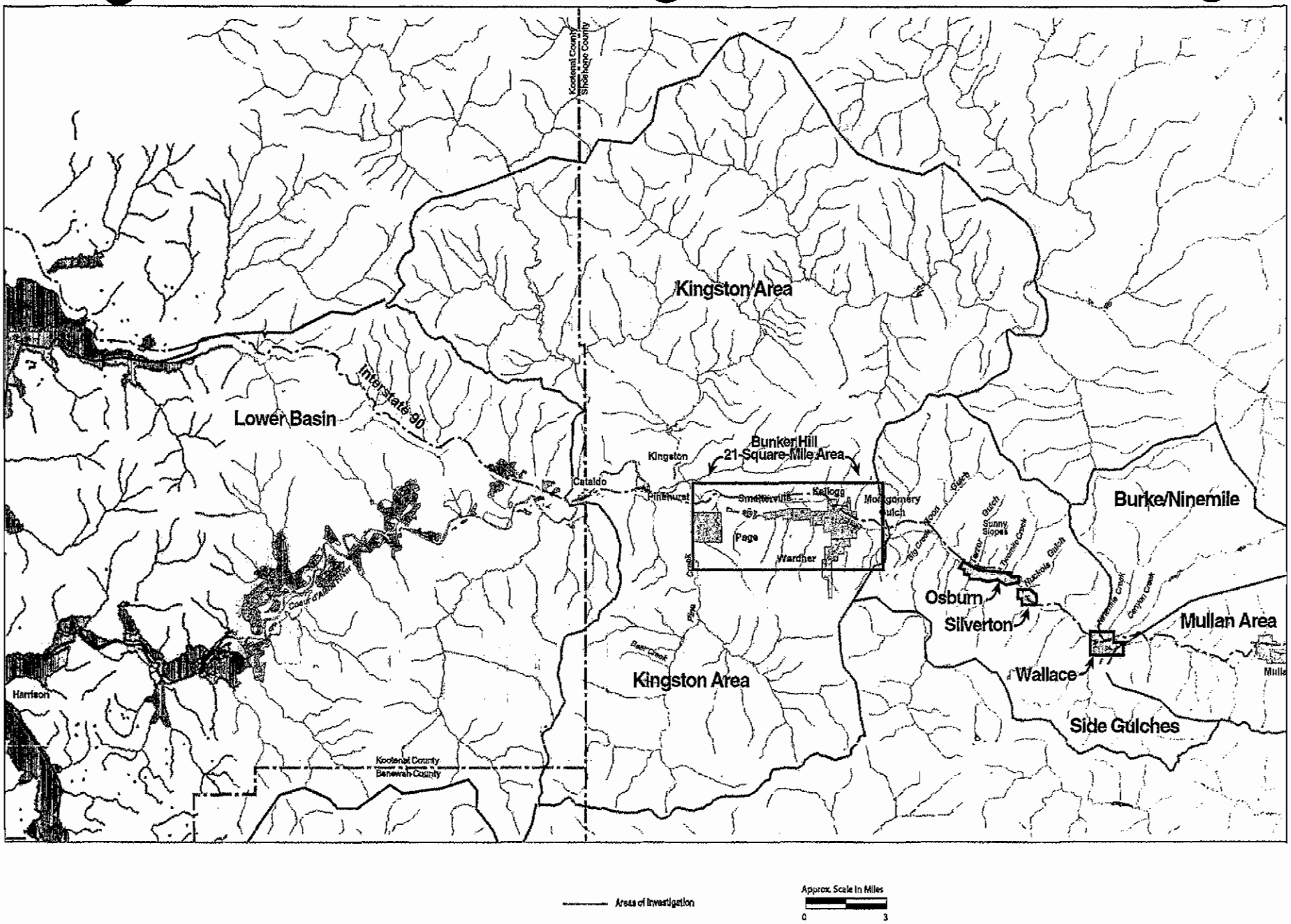


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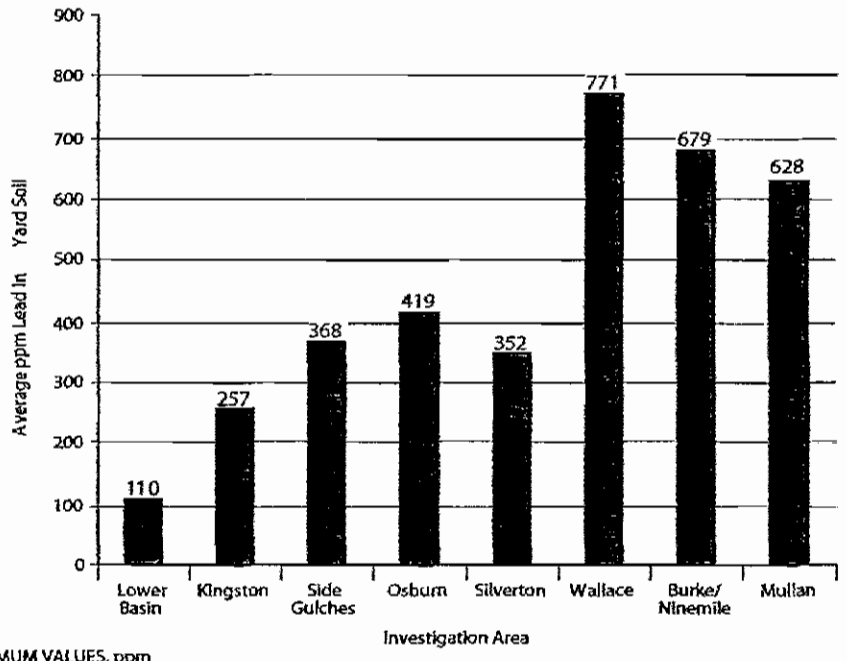
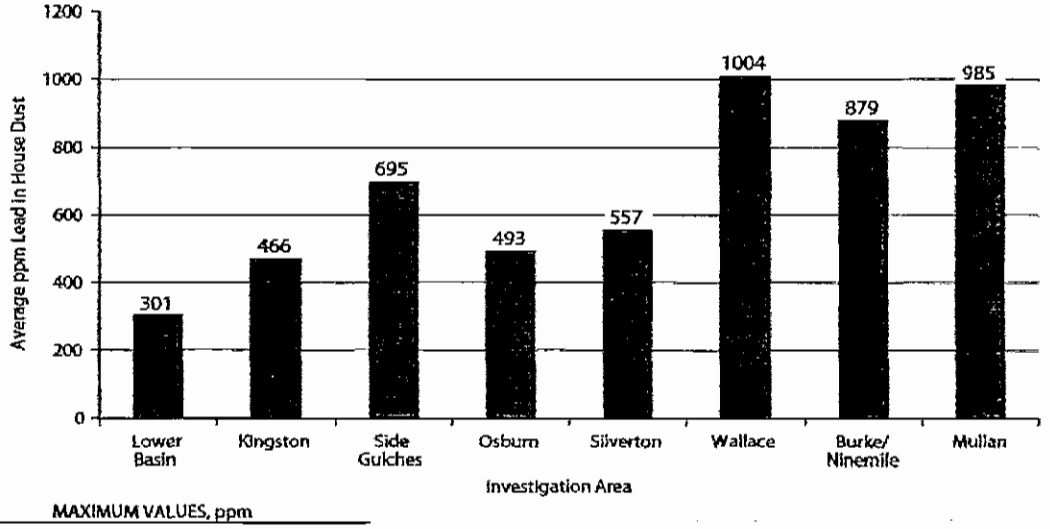
Figure 4.1-1
Human Health Alternatives Investigation Areas



MAXIMUM VALUES, ppm			
Lower Basin	7350	Silverton	6098
Kingston	0229	Wallace	16026
Side Gulches	3356	Burke/Ninemile	5410
Osburn	12884	Mullan	20218

NOTE: Data from Human Health Risk Assessment, TerraGraphics Environmental Engineering, 2000.

Figure 4.2-1
Lead Levels in Yard Soil



MAXIMUM VALUES, ppm			
Lower Basin	3140	Silverton	3390
Kingston	1750	Wallace	29725
Side Gulches	3929	Burke/Ninemile	5800
Osburn	2192	Mullan	4060

NOTE: Data from Human Health Risk Assessment, TerraGraphics Environmental Engineering, 2000.

Figure 4.2-2
Lead Levels in House Dust

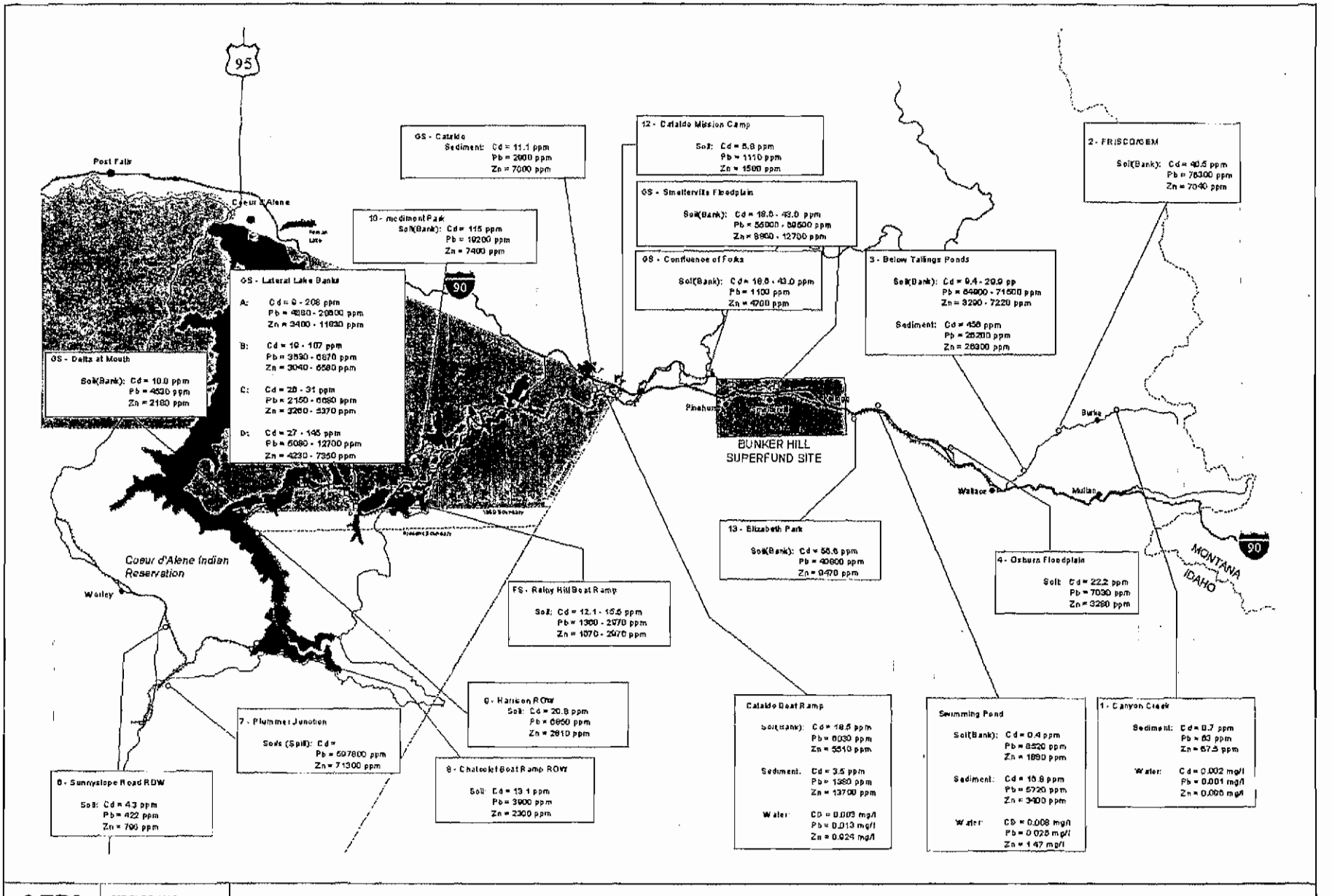


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Figure 4.2-3
Coeur d'Alene Basin Soil & Water Sampling Map

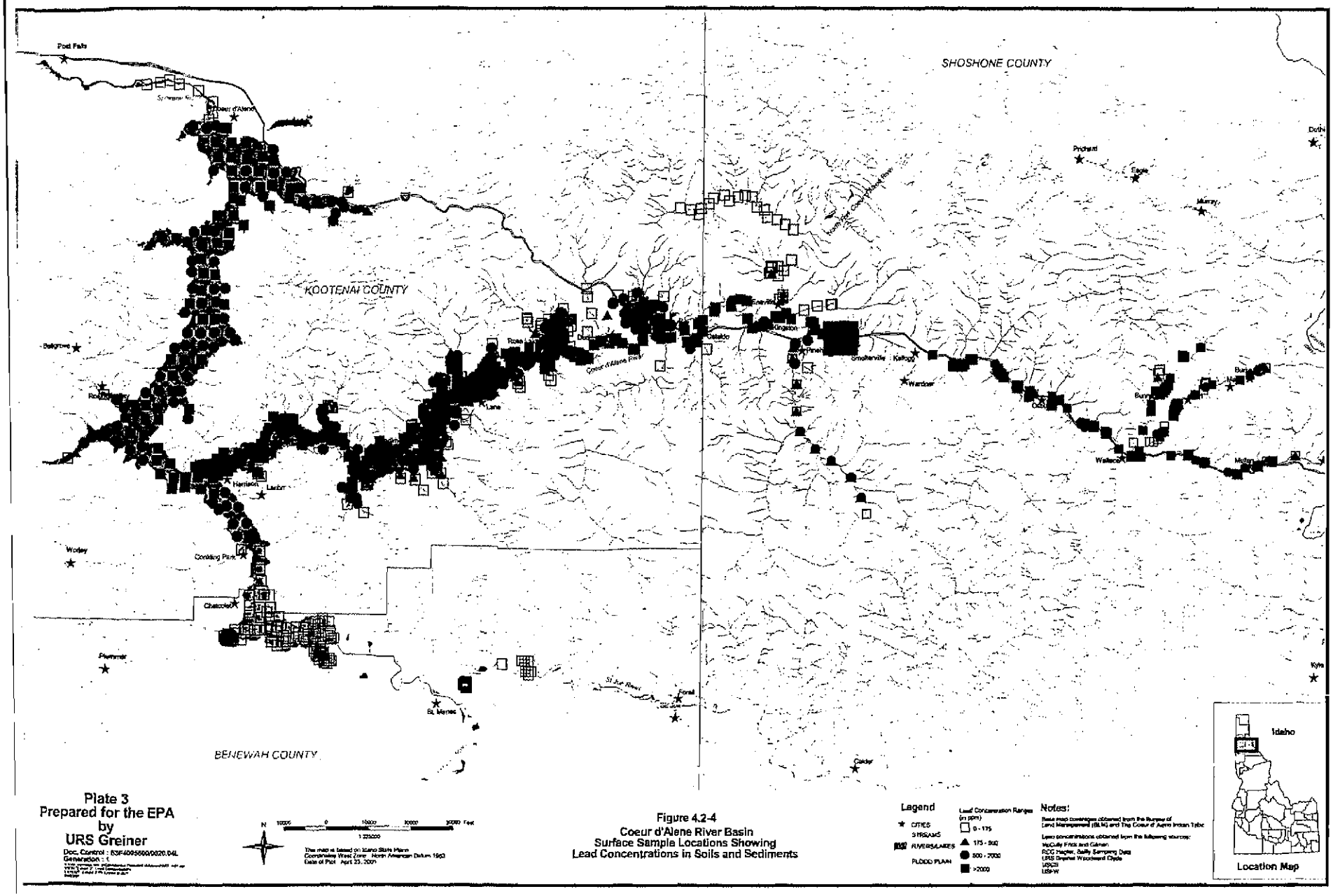

Plate 3
Prepared for the EPA
by
URS Greiner

Doc. Control : 63F40055600/0020.04L
Generation : 1

Figure 4.2-4
Coeur d'Alene River Basin
Surface Sample Locations Showing
Lead Concentrations in Soils and Sediments

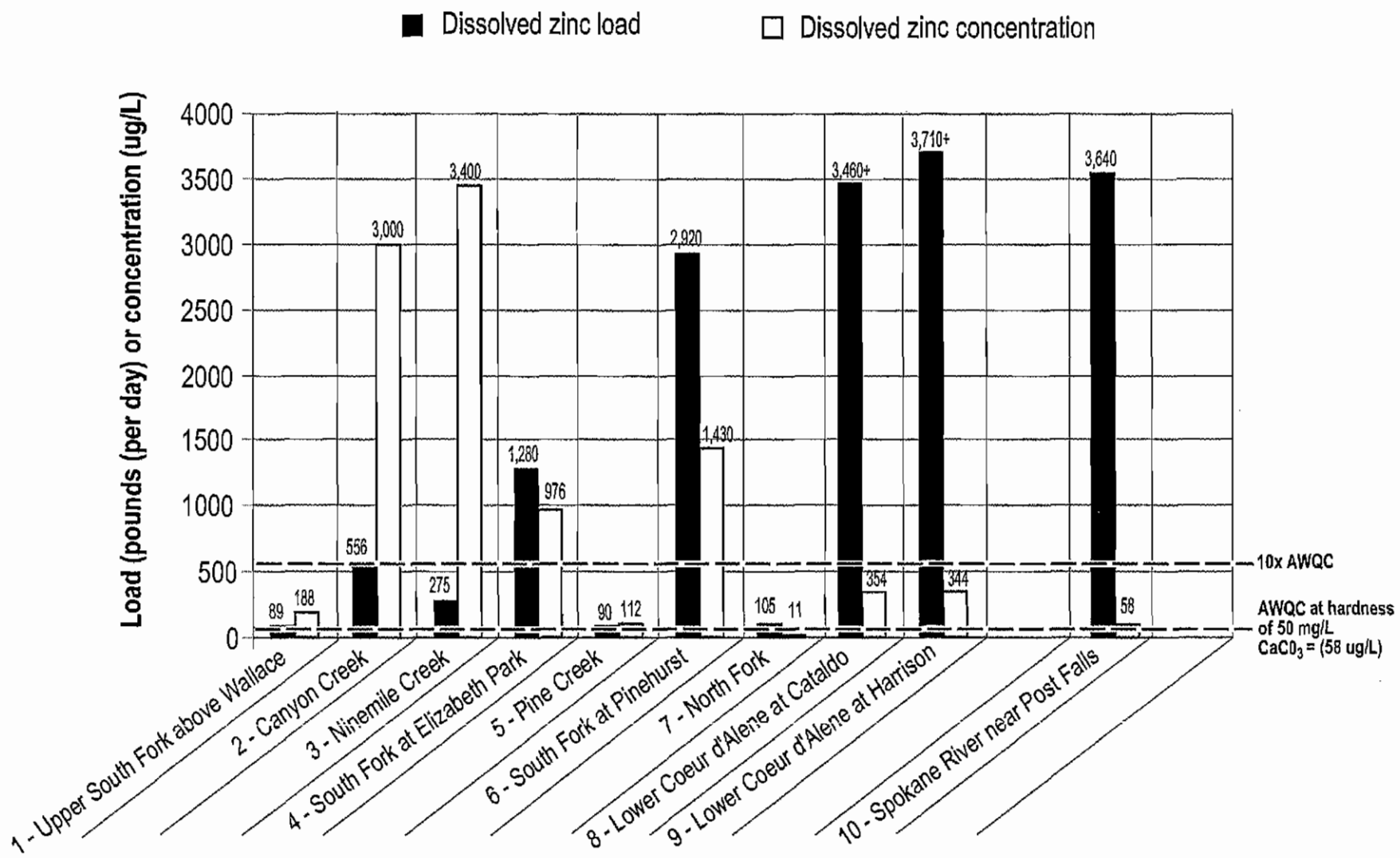

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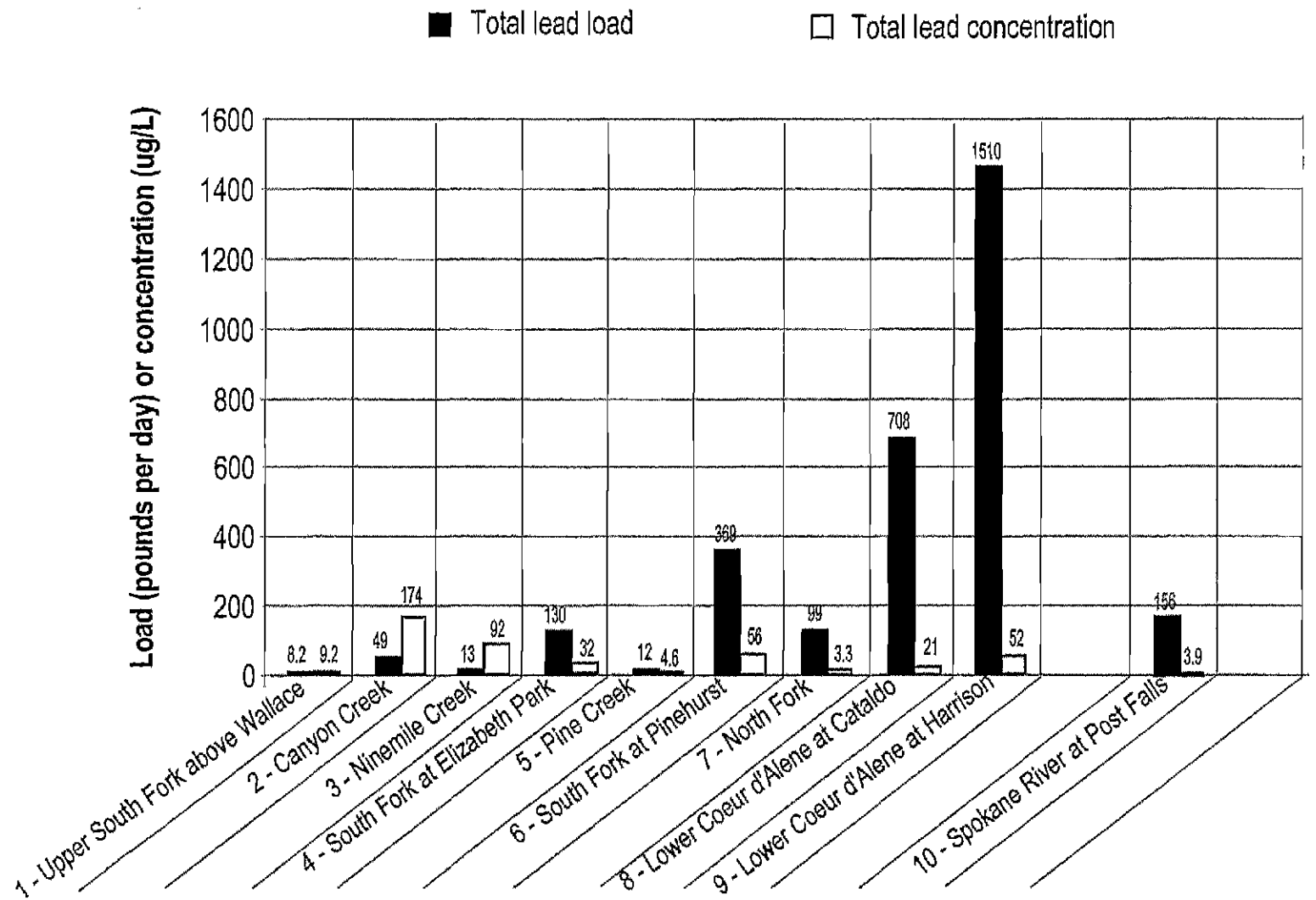
Figure 4.2-5
Estimated Average Values of Dissolved Zinc Loads and Concentrations (1991-1999 Data)



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Generation: 1

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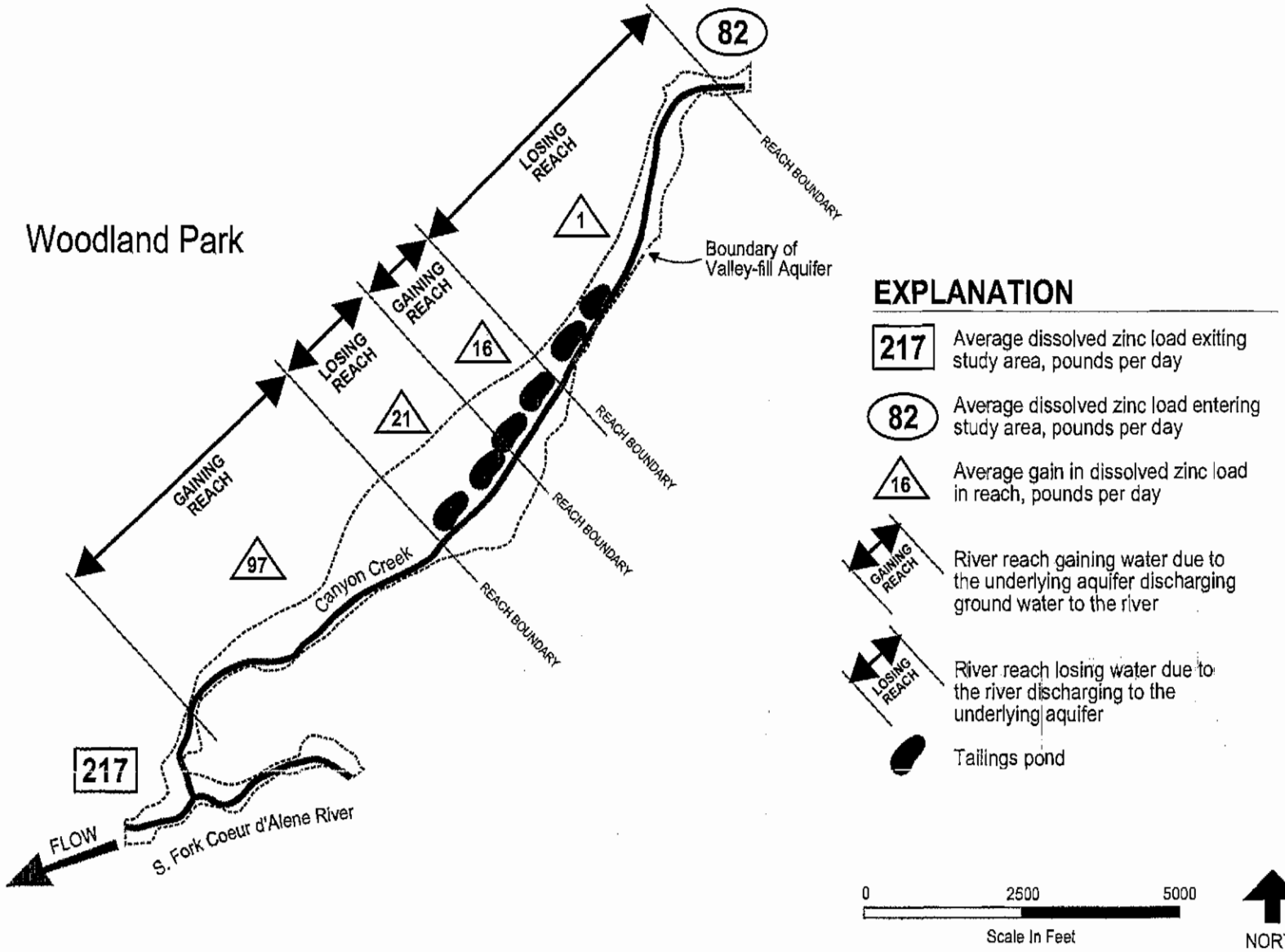
Figure 4.2-6
Estimated Average Values of Total Lead Loads and Concentrations (1991-1999 Data)



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Coeur d'Alene Basin RI/FS
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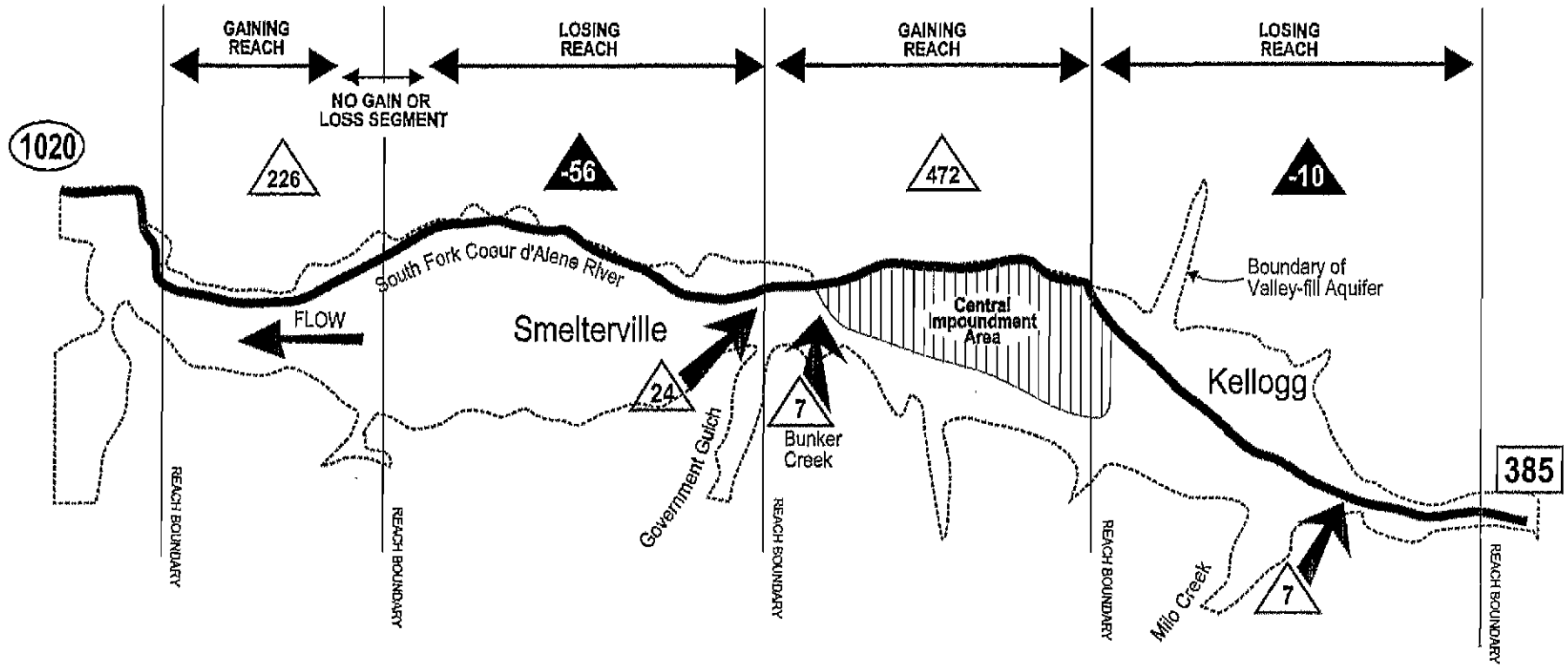
Figure 4.2-7
Dissolved Zinc Loads in Canyon Creek at Woodland Park, September 17, 18, and 19, 1999



EXPLANATION

385	Average dissolved zinc load entering study area, pounds per day
1020	Average dissolved zinc load exiting study area, pounds per day
16	Average gain in dissolved zinc load in reach, pounds per day
-16	Average loss in dissolved zinc load in reach, pounds per day
GAINING REACH	River reach gaining water due to the underlying aquifer discharging ground water to the river
LOSING REACH	River reach losing water due to the river discharging to the underlying aquifer

0 5000
Scale in Feet

NORTH

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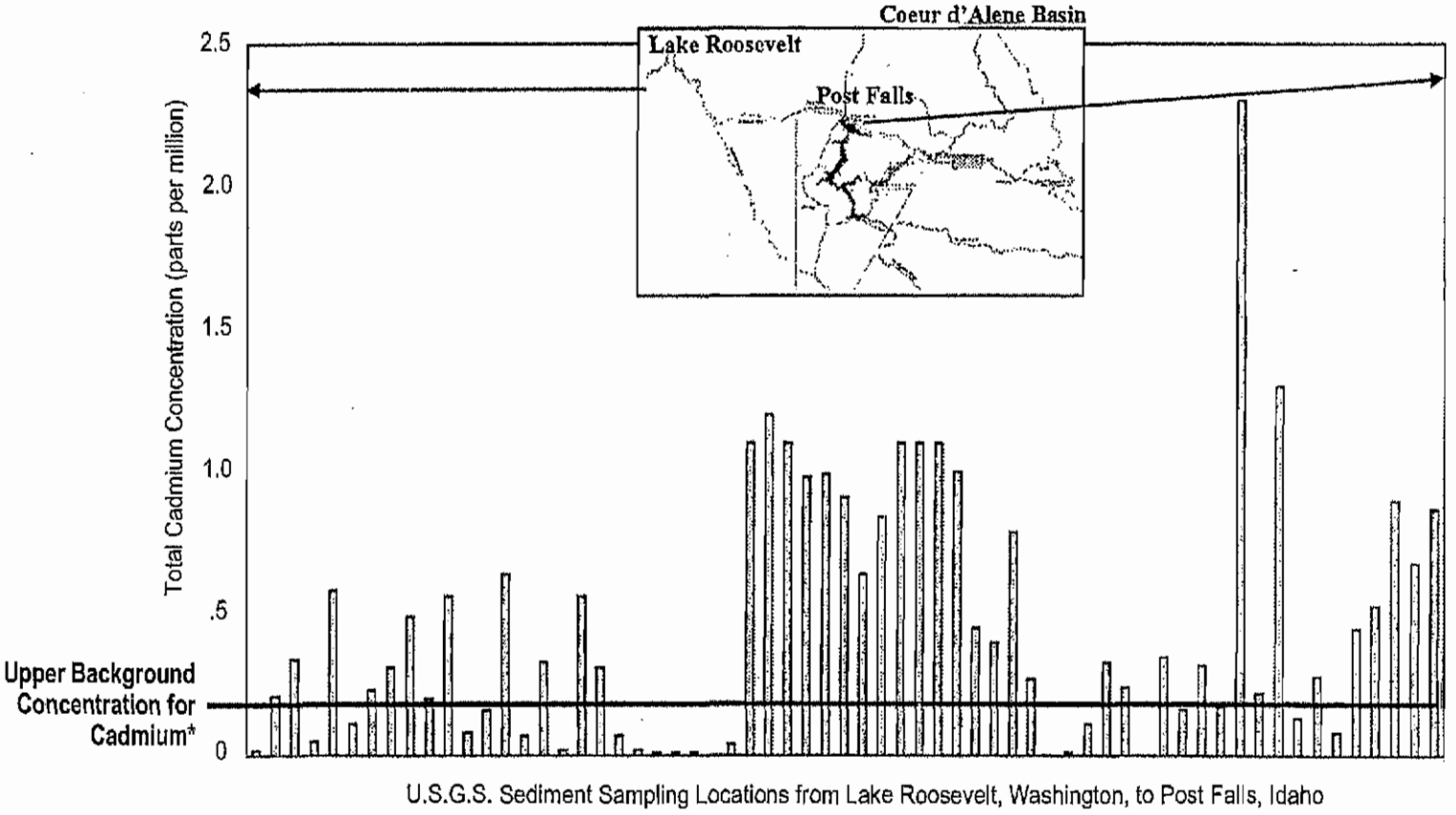
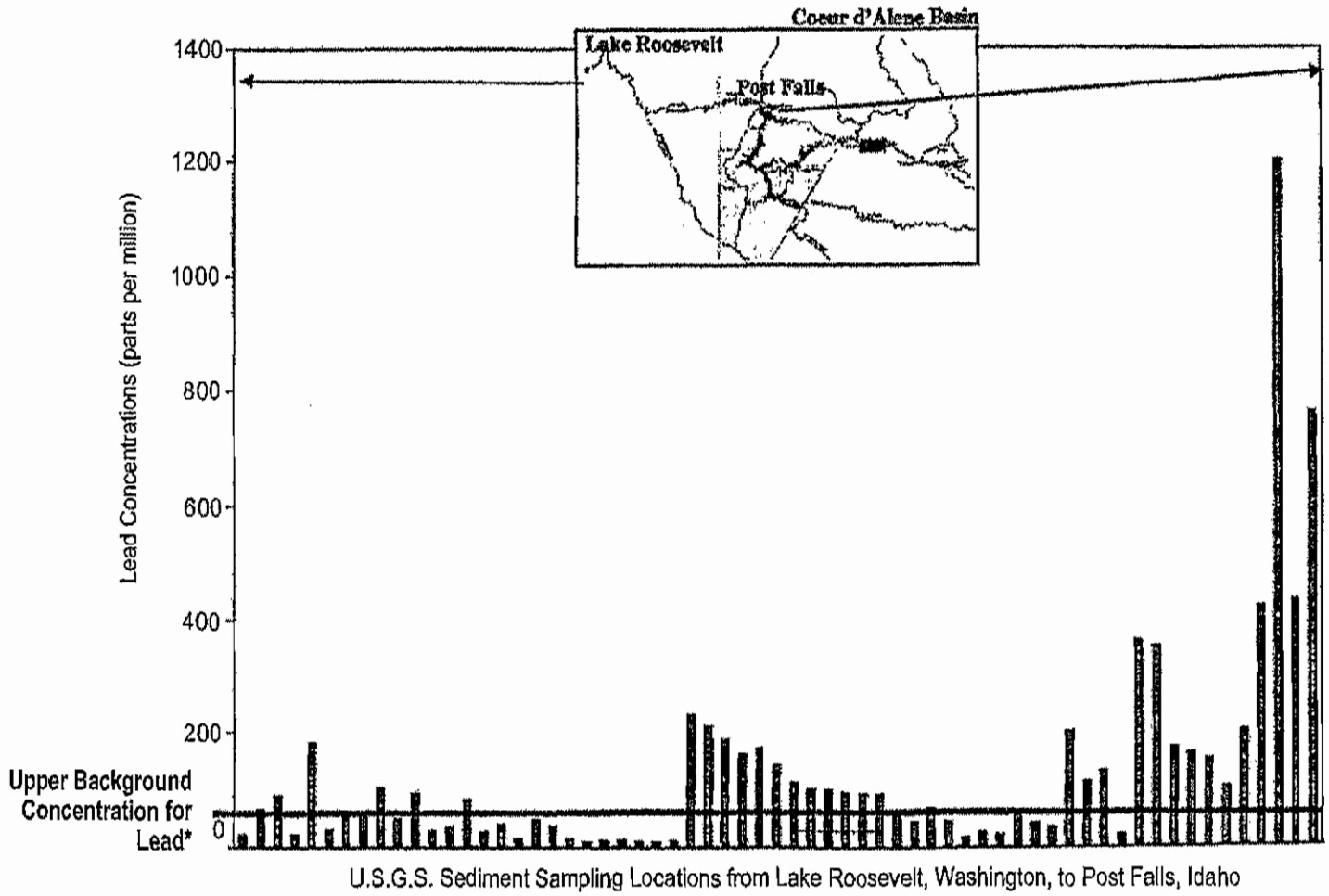
Figure 4.2-8
Dissolved Zinc Loads in the South Fork Coeur d'Alene River near Kellogg and Smelterville, September 17, 18, and 19,1999



*Source: URS. Final Technical Memorandum (Rev.2) Estimation of Background Concentrations in Soil, Sediment, and Surface Water in the Coeur d'Alene and Spokane River Basins, June 2001.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 RRB9	**Figure 4.2-9** **Total Cadmium Concentrations in Spokane River Sediments**



*Source: URS. Final Technical Memorandum (Rev.2) Estimation of Background Concentrations in Soil, Sediment, and Surface Water in the Coeur d'Alene and Spokane River Basins, June 2001.

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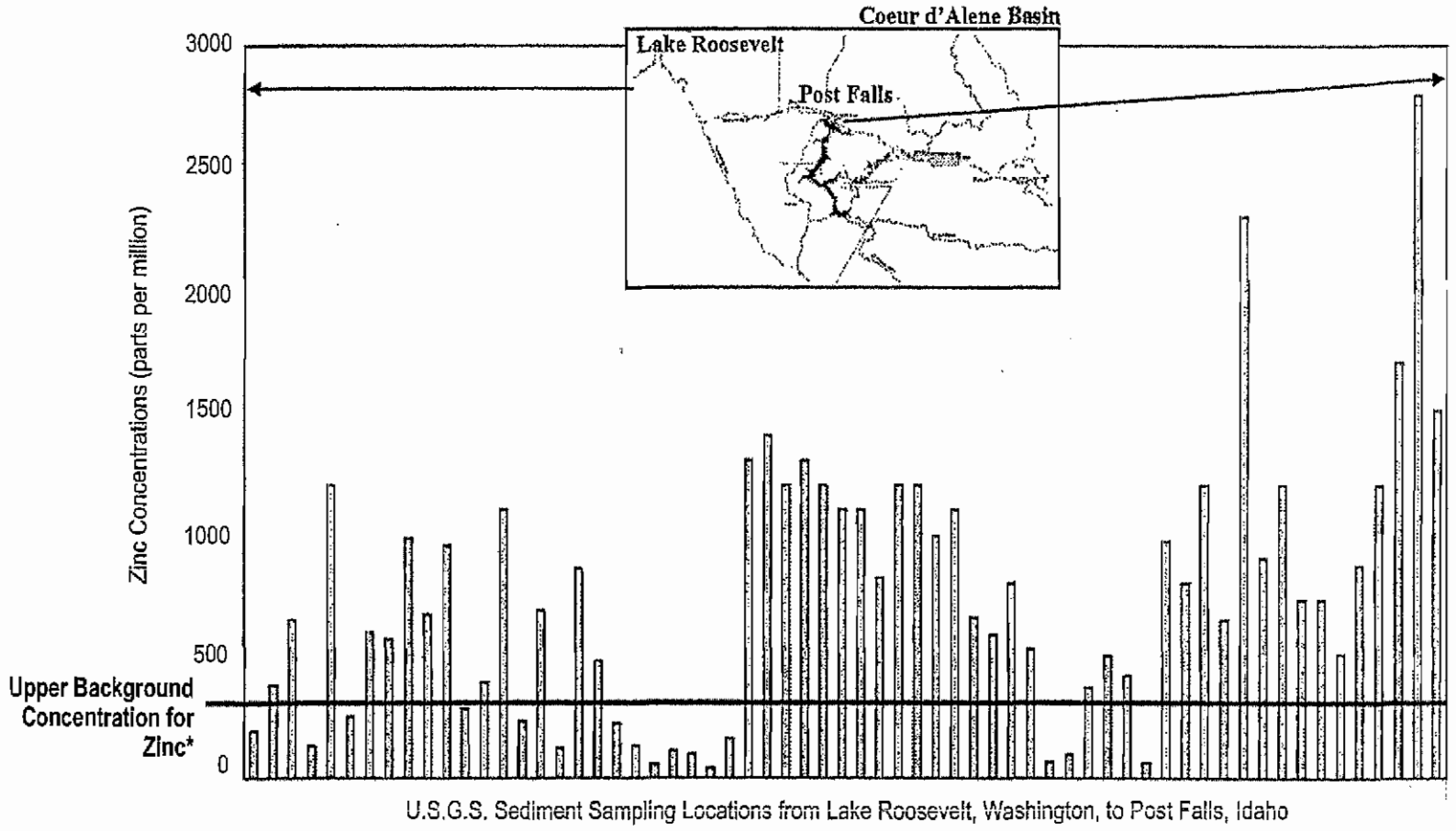
Figure 4.2-10
Total Lead Concentrations in Spokane River Sediments



*Source: URS. Final Technical Memorandum (Rev.2) Estimation of Background Concentrations in Soil, Sediment, and Surface Water in the Coeur d'Alene and Spokane River Basins, June 2001.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06654.05a Generation: 1 RRB10	Figure 4.2-11 Total Zinc Concentrations in Spokane River Sediments

Table 4.2-1
Estimated Number of Residential Yards Needing Remediation for Protection of Human Health

Community	Estimated Total Residential Yards[a]	Estimated Percentage of Yards Needing Remediation[b]		Estimated Number of Yards Needing Remediation[c]	
PRGs	--	700 ppm	1,000 ppm	700 ppm	1,000 ppm
Mullan	548	46	33	252	181
Wallace	649	61	39	396	253
Burke/Ninemile					
Canyon Creek	173	59.5	45	103	78
Ninemile Creek	72	59.5	45	43	32
Silverton	360	19.5	10	70	36
Osburn	847	23.5	12.4	199	105
Side Gulches	624	21	8	131	50
Kingston	1,006	15.5	13	156	131
Lower Basin	1,642	13	13	213	213
Total	5,921	26.4	18.2	1,563	1,079

[a] Total number of yards estimated on the basis of the total yards for conceptual site model units reported in Table 3-18 of the Draft Human Health Risk Assessment (see Appendix B). The total number of residential yards in CSM unit Burke/Ninemile were prorated to Ninemile Creek and Canyon Creek on the basis of field reconnaissance by CH2M HILL (70.6 percent for Canyon Creek; 29.4 percent for Ninemile Creek).

[b] For 1,000 ppm PRGs, the percentage of yards needing remediation was estimated on the basis of the percentage of yards exceeding 1,000 ppm lead in Tables 6-11a – 6-11j of the Draft Human Health Risk Assessment; for the 700 ppm PRG, the percentage of yards needing remediation was estimated on the basis of the average of the percentage of homes remediated as listed in Tables 6-62d and 6-62e of the Draft Human Health Risk Assessment.

[c] Estimated by multiplying the estimated total number of yards by the estimated percentage of yards needing remediation.

Table 4.2-2
Estimated Number of Residences with Drinking Water MCL Exceedances

Area of Investigation	Number of Residences[a]	Assumed Number of Private, Unregulated Sources[b]	Estimated Frequency of MCL Exceedances[c]	Estimated Number of Residences with MCL Exceedances[d]	Nearest Water District	Inside/Outside Nearest Water District	Assumed Maximum Distance to Utility Tie-in[e] (miles)	Availability of Suitable Alternative Aquifer[f]	Assumed Number of Wells to Abandon[g]
Upper Basin									
Mullan	553	20	3%	1	East Shoshone County Water District	Inside	100 feet	Low-none	1
Burke/Ninemile	265								
Ninemile Creek Communities	NE								
McCarthy	NE	60	3%	2	East Shoshone County Water District	Outside	1	Low-none	2
Day Rock	NE	3	3%	0	East Shoshone County Water District	Outside	0.5	Low-none	0
BlackCloud	NE	25	3%	1	East Shoshone County Water District	Outside	0.9	Low-none	1
Zanettiville	NE	10	3%	0	East Shoshone County Water District	Outside	1.5	Low-none	0
Canyon Creek Communities	NE								
Woodland Park	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0
Gem	NE	40	3%	1	East Shoshone County Water District	Outside	2.25	Low-none	1
Frisco	NE	5	3%	0	East Shoshone County Water District	Outside	0.3	Low-none	0
Black Bear	NE	10	3%	0	East Shoshone County Water District	Outside	0.1	Low-none	0
Yellow Dog	NE	5	3%	0	East Shoshone County Water District	Outside	0.5	Low-none	0
Cornwall	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0
Mace	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0

Table 4.2-2 (Continued)
Estimated Number of Residences with Drinking Water MCL Exceedances

Area of Investigation	Number of Residences[a]	Assumed Number of Private, Unregulated Sources[b]	Estimated Frequency of MCL Exceedances[c]	Estimated Number of Residences with MCL Exceedances[d]	Nearest Water District	Inside/Outside Nearest Water District	Assumed Maximum Distance to Utility Tie-in[e] (miles)	Availability of Suitable Alternative Aquifer	Assumed Number of Wells to Abandon[f]
Upper Basin (Continued)									
Burke	NE	0	3%	0	East Shoshone County Water District	Inside	100 feet	Low	0
Wallace	767	10	3%	0	East Shoshone County Water District	Inside	100 feet	Low-none	0
Silverton	376	20	3%	1	East Shoshone County Water District	Inside	100 feet	Low-none	1
Osburn	1026	40	3%	1	Central Shoshone County Water District	Inside	100 feet	none[g]	1
Side Gulches	640								
Nuckols Gulch	NE	50	3%	2	Central Shoshone County Water District	Outside	1	Low-none	2
Twomile Creek	NE	50	3%	2	Central Shoshone County Water District	Outside	2	Low-none	2
Sunny Slopes	NE	10	3%	0	Central Shoshone County Water District	Inside	100 feet	Low-none	0
Terror Gulch	NE	30	3%	1	Central Shoshone County Water District	Outside	2	Low-none	1
Big Creek	NE	0	3%	0	Central Shoshone County Water District	Inside	100 feet	Low-none	0
Moon Gulch	NE	60	3%	2	Central Shoshone County Water District	Outside	3	Low-none	2
Montgomery Gulch	NE	0	3%	0	Central Shoshone County Water District	Inside	100 feet	Low-none	0
Kingston	1006	768	10%	77	Kingston Water District	238 connections[h]	NE[i]	Medium	77
Pine Creek (above BHSS to Bear Creek)	30	15	10%	2	Pinehurst Water District	Inside	100 feet	Low	2

Table 4.2-2 (Continued)
Estimated Number of Residences with Drinking Water MCL Exceedances

Area of Investigation	Number of Residences[a]	Assumed Number of Private, Unregulated Sources[b]	Estimated Frequency of MCL Exceedances[c]	Estimated Number of Residences with MCL Exceedances[d]	Nearest Water District	Inside/Outside Nearest Water District	Assumed Maximum Distance to Utility Tie-in[e] (miles)	Availability of Suitable Alternative Aquifer	Assumed Number of Wells to Abandon[f]
Lower Basin									
Cataldo	1642	400	10%	40	Cataldo Water District	Assume partial service	NE[i]	Medium	40
Harrison		400	10%	40	Harrison Water District	Assume partial service	NE[i]	High	40

Notes:
[a] Based on site reconnaissance and demographic data from the human health risk assessment (TerraGraphics and URSG 2000).
[b] Assumes 100 percent of residences outside water district service boundaries have private, unregulated sources.
[c] See Table 4-6 of the FS Part 2 (CH2M HILL 2000) for actual observed MCL exceedances. Lower basin value applied to Kingston area because of small Kingston data set.
[d] See text for basis.
[e] Areas within municipal water district service boundaries are assumed to be less than or equal to 100 feet from a utility tie-in. Values for Ninemile and Canyon Creek areas outside water districts are incremental from nearest downgradient neighbor.
[f] Assumes 50 percent of private, unregulated sources in rural areas are water wells and 50 percent are springs. In-town numbers based on consultation with local water district.
[g] Osburn has a moratorium on new well construction.
[h] Based on IDEQ 1999 annual survey of public water systems, the Kingston Water District #1 serves 238 connections.
[i] Too little is known about the small water systems in Kingston Water District and lower basin water districts to provide a meaningful estimate.
[j] More information pending from EPA-initiated voluntary drinking water program.
NE = Not Estimated

Table 4.2-3
Residences Exceeding Lead Concentration Thresholds for House Dust

Consideration	Area of Investigation							
	Lower Basin	Kingston	Side Gulches	Ninemile	Mullan	Osburn	Silverton	Wallace
Number of housing units per area 1999[a]	1642	1006	640	265	553	1026	376	767
Number of vacuum bag samples[b]	31	30	26	35	32	84	26	35
Number of Housing Units Exceeding Lead Concentration Thresholds								
>500 mg/kg lead	575	503	442	183	520	616	233	683
>1,500 mg/kg lead	94	29	122	81	131	19	43	109

[a]Values from Table 3-18 of the human health risk assessment (TerraGraphics and URSG 2000) and developed from 1990 census and 1999 sewer district data. Lower basin data not available for 1999 so value shown is solely from 1990 census data.
[b]Assumed to represent entire area of investigation.

Table 4.2-4
Summary of Basin Ecological Source Quantities

Source Type	Units	Quantity
Upper Basin		
Floodplain Sediments[a]	cy	7,100,000
Tailings[b]	cy	11,000,000
Waste Rock[c]	cy	11,700,000
Adit Drainage[d]	#Zn/d	101
Lower Basin		
Riverbed Sediments[e]	cy	17,600,000
Bank Wedges[e]	cy	1,780,000
Wetland Sediments[e]	cy	5,900,000
Lateral Lake Sediments[e]	cy	5,900,000
Floodplain Sediments[e]	cy	10,200,000
Cataldo/Mission Flats Dredge Spoils	cy	13,600,000
Coeur d'Alene Lake		
Lake Bottom Sediments	metric tons	75,000,000
Spokane River[f]	cy	260,000

[a]Impacted sediment present in the current and historic 100-year floodplain. Total volume does not include either less impacted, generally deeper and more dispersed sediments that are potential source of zinc loading or impacted materials within fills or embankments (e.g., I-90 and UPRR rights-of-way); these additional sediment volumes may be as high as approximately 20,000,000 cy.
[b]Tailings volumes include unimpounded tailings and impounded tailings in both inactive and active facilities.
[c]Waste rock volumes include waste rock in floodplains and uplands, as well as waste rock at active facilities.
[d]Data used to calculate average zinc loading are available for only 53 of 114 discharging adits in the upper basin. Although data are available for the largest loaders, the cumulative average zinc load from all discharging adits may exceed the amount shown in this table.
[e]Volumes estimates for all impacted media in the lower basin, CSM Unit 3, are based on lead concentrations exceeding 1,000 mg/kg. Additional volumes of impacted sediments that are potential sources of zinc loading are not included in these estimates.
[f]Contaminated sediments upstream of Upriver Dam. Additional contaminated sediments are present downstream of Upriver Dam, but have not been quantified.

Notes:
This is a condensed summary with approximate quantities--for a detailed accounting of sources and remedial actions see the FS Part 3, Sections 5 and 6 and appendices as referenced therein (URSG and CH2M HILL 2000c).
Quantities of source materials within the BHSS are not included in this table.
cy - cubic yards
#Zn/d - pounds of zinc per day

Table 4.2-5
Metals Loads and Retention in Coeur d'Alene Lake

Parameter	1994 (low discharge)	1995 (average discharge)	1997 (high discharge)	1999 (120% of average discharge)
Annual mean discharge (cfs)	2,970	6,300	10,300	7,530
Zinc				
Total Inflow (kg)	460,000	880,000	1,400,000	1,570,000
Total Outflow (kg)	260,000	580,000	860,000	1,080,000
%Retained	43	35	41	31
Lead				
Total Inflow (kg)	88,000	470,000	1,300,000	590,000
Total Outflow (kg)	16,000	37,000	100,000	51,300
%Retained	82	92	92	91
Cadmium				
Total Inflow (kg)	3,800	7,200	11,000	10,400
Total Outflow (kg)	1,700	3,600	5,800	4,940
%Retained	56	51	47	53

Note: Refers to whole-water recoverable metals loads

5.0 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

5.1 CURRENT LAND USE

Site land uses include residential, recreational, agricultural, and light urbanization or industrialization. Human habitation is primarily concentrated in communities along the South Fork Coeur d'Alene River and population centers in the cities of Coeur d'Alene and Post Falls, Idaho, and Spokane, Washington. The Basin is the ancestral home of the Coeur d'Alene Tribe. Coeur d'Alene Tribe lands are present in the Lower Basin. Spokane Tribe lands are present along the lower Spokane River in the state of Washington.

Most of the site is undeveloped and includes large areas of federal and state land. Undeveloped areas include upland forest habitats and lowland floodplains with riverine, riparian, wetland, and lake habitats. The quality of these habitats and their ability to support natural populations of flora and fauna has been impacted to varying degrees by historic mining activity in the basin.

The majority of the population of the Basin lives in the cities of Coeur d'Alene and Post Falls, which have populations exceeding 10,000 people. All other communities in the Basin have populations less than 6,500. In both Kootenai and Shoshone counties, over 38 percent of the total population live in rural areas outside of these two major cities. The total population of the area addressed by the human health alternatives is approximately 10,500.

A number of indicators show depressed socio-economic conditions are present in the Basin compared to statewide conditions, including:

- Higher unemployment
- Higher percentages of persons living below the poverty level
- Lower rates of high school and college graduation
- Higher per capita welfare payments

The socio-economic status of families has been noted to be a significant factor affecting children's blood lead levels in numerous studies (Pirkle et al. 1998, Brody et al. 1994, Clark et al. 1985, Bornschein et al. 1985). In the Basin, young children often have limited places to play, and when not at their home are often found on commercial properties.
In addition to residential, developed land use includes commercial, light industrial, and agriculture. The I-90 freeway parallels the river from Cataldo east to the Idaho-Montana border. A railroad right-of-way parallels the entire length of the river as well as the lake. It is currently being converted to a trail system.

Much of the Coeur d'Alene Basin consists of rural, undeveloped land. Approximately 32 percent of Kootenai County and 75 percent of Shoshone County is federally managed land, primarily National Forest. These undeveloped lands and the numerous streams in the Basin provide abundant recreation opportunities. Figure 5.1-1 and 5.1-2 show private and public land ownership in the Upper Basin.

5.2 ANTICIPATED FUTURE LAND USES

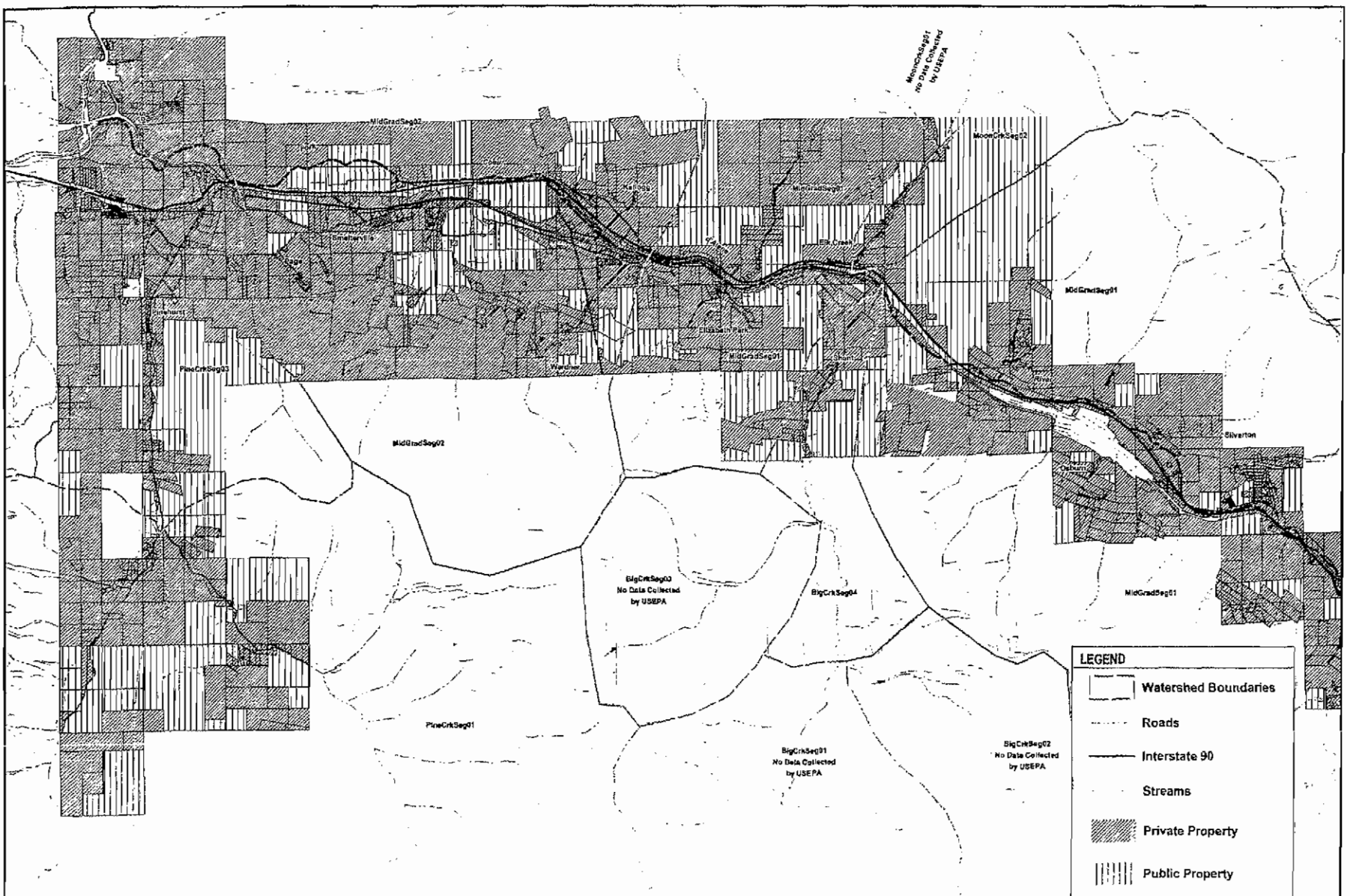
It is anticipated that future land use will be similar to current or reasonable foreseeable future land use. Although population levels in the Basin have declined in recent years, the City of Coeur d'Alene has experienced substantial population growth, and it is possible that population growth could expand into the Basin. In this case, areas of the Lower Basin floodplains that are currently undeveloped or used for agriculture could be developed for residential use. Increased recreational use of beaches may occur as a result of several factors: (1) increasing tourism in the Basin; (2) easier access due to the conversion of the Union Pacific Railroad Right-of-Way, which parallels the river, into a trail; and (3) potential increased population.

The Tribes are concerned with protection of subsistence lifestyles. Individuals practicing a subsistence lifestyle would potentially have substantially larger exposures to metals in soil, sediment, water, native vegetables, and fish caught in the Basin than individuals practicing non-subsistence lifestyles. Current levels of contamination preclude the use of historic tribal resources and the practice of a subsistence lifestyle by individuals who would choose to do so.

5.3 GROUNDWATER AND SURFACE WATER USES

The state of Idaho has identified designated beneficial uses for the surface water of the Idaho portion of the Basin. The designated uses generally reflect current surface water uses, with some exceptions where the designated uses are not currently attained. For example, Ninemile Creek, from and including East Fork Ninemile Creek to its mouth, is designated for coldwater aquatic life and salmonid spawning. These uses are not currently attained in Ninemile Creek downstream of mining impacts. Similarly, coldwater aquatic life is not attained in Canyon Creek downstream of mining impacts. The use designations do not reflect pre-mining use and condition of the stream, nor are they intended to reflect remediation goals. The designated uses and areas of current non-attainment are presented in Table 5.3-1.

Groundwater and surface water are used as drinking water sources in the Basin. Within the Basin, about 57 percent of residences obtain water from a public source and 43 percent obtain water from a private source. Table 5.3-2 describes the public drinking water systems in the Basin, and Table 5.3-3 shows the estimated number of residences using private drinking water sources within the human health alternatives study area.



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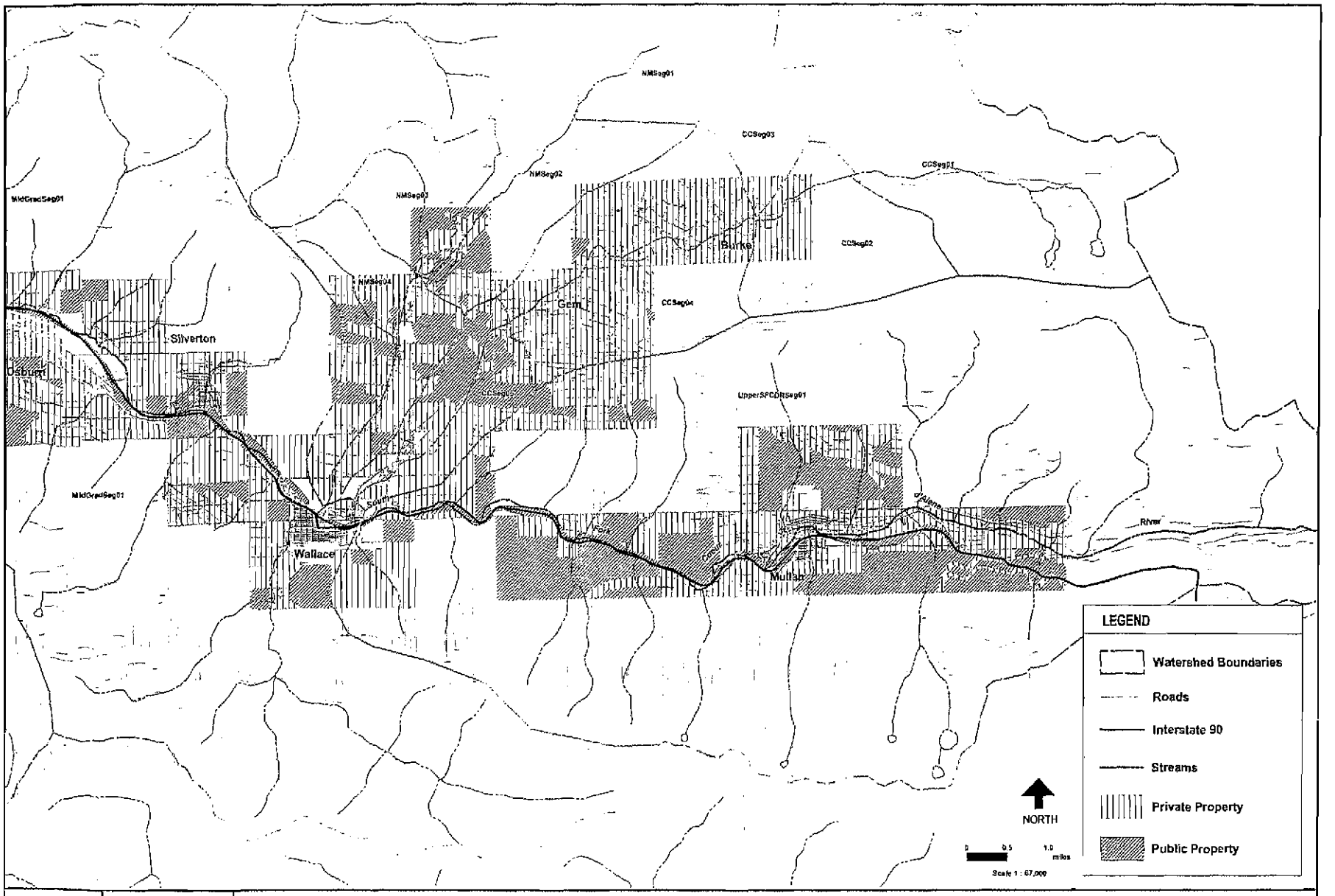
Coeur d'Alene Basin RI/FS
REMEDY REVIEW BOARD

Figure 5.1-1
Public and Private Land Ownership in the South Fork Coeur d'Alene Basin



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REMEDY REVIEW BOARD

Figure 5.1-2
Public and Private Land Ownership in the South Fork Coeur d'Alene Basin

Table 5.3-1
Surface Water Designated Beneficial Uses

Waters	Aquatic Life	Recreation	Other
South Fork Coeur d'Alene River - Canyon Creek to mouth		SCR	
Pine Creek - East Fork Pine Creek to mouth	**COLD; SS**	SCR	
Pine Creek - source to East Fork Pine Creek	COLD; SS	PCR	DWS
East Fork Pine Creek - source to mouth	**COLD; SS**		
Government Gulch - source to mouth	***COLD; SS***	SCR	
Big Creek - source to mining impact area	COLD; SS	PCR	DWS
Big Creek - mining impact area to north	COLD; SS	SCR	
Shields Gulch - source to mining impact area	COLD; SS	PCR	DWS
Shields Gulch - mining impact area to mouth		SCR	
Lake Creek - source to mining impact area	COLD; SS	PCR	DWS
Lake Creek - mining impact area to mouth	**COLD; SS**	SCR	
Placer Creek - source to mouth[a]	COLD		
South Fork Coeur d'Alene River - from and including Daisy Gulch to Canyon Creek	COLD	SCR	
Willow Creek - source to mouth[a]			
South Fork Coeur d'Alene River - source to Daisy Gulch	COLD; SS	PCR	DWS
Canyon Creek - from and including Gorge Gulch to mouth	***COLD***	SCR	
Canyon Creek - source to Gorge Gulch	COLD; SS	PCR	DWS
Ninemile Creek - from and including East Fork Ninemile Creek to mouth	**COLD; SS**	SCR	
Ninemile Creek - source to East Fork Ninemile Creek	COLD; SS	PCR	DWS
Moon Creek - source to mouth[a]			
West Fork Moon Creek - source to mouth[a]			
Bear Creek - source to mouth	COLD; SS	PCR	DWS
Coeur d'Alene Lake	COLD; SS	PCR	DWS SRW
Coeur d'Alene River - South Fork Coeur d'Alene River to mouth	**COLD**	PCR	

[a] These waters, although undesignated, are protected for coldwater aquatic life, primary contract recreation, and secondary contact recreation (IDAPA 16.01.02, Section 101–Undesginated Uses)
BOLD indicates use is partially supported
BOLD ITALICS indicates use is not supported
Notes:
All waters are designated for agricultural and industrial water supply, wildlife habitat, and aesthetics.
COLD = Coldwater aquatic life
DWS = Drinking water supply
PCR = Primary contact recreation
SCR = Secondary contact recreation
SRW = Special resource water
SS = Salmonid spawning

Table 5.3-2
Coeur d'Alene River Basin Public Drinking Water Systems

Type of System	Water Source	Population	Connections	Comments
Community public water system	Wells	4490	1875	
	Surface water	7013	3446	Central Shoshone Water District (population=4052, connections=2293) is temporarily using surface water while well undergoes corrosivity evaluation.
	Unknown	574	226	
Non-community transient public water system	Wells	385	120	
	Unknown	500	1	
Non-transient, non-community public water system	Wells	445	2	
	Surface water	490	13	
	Unknown	170	2	

Table 5.3-3
Estimated Number of Residences with Private, Unregulated Drinking Water Sources

Area of Investigation	Number of Residences[a]	Number of Residences within Water District	Estimated Number of Private, Unregulated Sources[b]	Nearest Water District	Availability of Suitable Alternative Aquifer
Upper Basin					
Mullan	553	533	20	East Shoshone County Water District	Low-none
Burke/Ninemile	265	107	158	East Shoshone County Water District	Low-none
Wallace	767	757	10	East Shoshone County Water District	Low-none
Silverton	376	356	20	East Shoshone County Water District	Low-none
Osburn	1026	986	40	Central Shoshone County Water District	none[c]
Side Gulches	640	440	200	Central Shoshone County Water District	Low-none
Kingston	1006	238	768	Kingston Water District	Medium
Pine Creek (above BHSS to Bear Creek)	30	15	15	Pinehurst Water District	Low
Lower Basin					
Cataldo	1642	842	400	Cataldo Water District	Medium
Harrison			400	Harrison Water District	High

Notes:
[a]Based on site reconnaissance and demographic data from the human health risk assessment (TerraGraphics and URSG 2000).
[b]Assumes 100 percent of residences outside water district service boundaries have private, unregulated sources.
[c]Osburn has a moratorium on new well construction.
NE = Not Estimated

6.0 SUMMARY OF RISKS

6.1 HUMAN HEALTH RISKS

Mining-related metals contamination in the basin has led to concerns about its effect on human health. As a result, numerous studies have been conducted in the basin by federal, state, and local agencies. These studies, along with the health-related programs currently conducted in the basin, are summarized below.

6.1.1 Basin-Wide Health Responses and Related Activities

In addition to the studies and mitigation responses conducted at the Bunker Hill area, several other human health studies that expanded into the larger basin area have been conducted in the past decade. These human health studies include:

- A residential sampling effort undertaken in the summer of 1996 by the Idaho Department of Health and Welfare (IDHW 2000)
- Two health consultations by the Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1998, 2000)
- Several Panhandle Health District (PHD) lead health surveys (Van Lindern 2000a; PHD 1992, 1997)
- Four residential EPA surveys conducted as part of the current basin-wide RI/FS under field sampling plan addenda FSPA06, FSPA07, FSPA12, and FSPA16 (URSG and CH2M HILL 1998, 1999a, 1999b, and 2000d)
- Sampling of school yards and daycare facilities conducted to support the human health risk assessment/removal actions under field sampling plan addendum FSPA13 (URSG and CH2M HILL 1999c)
- Multiple special studies conducted for the Natural Resource Damage Assessment (NRDA)

The IDHW study characterized environmental contamination and biological indices from 843 homes in the basin. The three EPA studies sampled 123 homes in the basin, and collected additional voluntary self-identified information over the past three years. IDHW and PHD in the upper and lower basin have provided fixed-site blood lead screening over the last 3 years.

6.1.2 Ongoing Basin-Wide Human Health Programs

Two programs that address human health issues are currently being conducted in the Basin. The first is the Lead Health Intervention Program run by the PHD. This program provides personal health and hygiene information to help mitigate exposure to contaminants. Services include educational programs, health monitoring programs, yard and home sampling, and nursing follow-up services.

The second ongoing program is the Institutional Controls Program (ICP) currently conducted in the BHSS, also run by the PHD. The ICP ensures that remedial technologies retain their integrity and effectiveness and are not compromised by future actions. To ensure the effectiveness of alternatives enacted throughout the basin, the ICP would be expanded to become a basin-wide program that would also see that future actions do not create new human health risks. The basin-wide ICP would include records maintenance, permitting, surveillance, inspections, and local construction regulations developed and implemented in conjunction with local zoning, building, or planning commissions.

Future uses of undeveloped areas would likely be addressed by local ordinance as part of the ICP. For drinking water, expansion of the BHSS "area of drilling concern" would advise drillers of the nonpotable nature of the main valley aquifer and of source area side gulches. For commercial and residential development, permitting would ensure that a local entity could evaluate the area for development and require standardized measures to prevent exposure to contaminants. This approach has been greatly successful as implemented by the PHD in Kellogg, Smelterville, Page, and Pinehurst.

The "information and intervention" components of the human health alternatives include both the Lead Health Intervention Program and the Institutional Controls Program.

6.1.3 Summary of Blood Lead Screening Surveys

Numerous blood lead screening surveys have been conducted in the basin, and specifically within the BHSS to evaluate the level of lead in residents' blood. The United States Centers for Disease Control (CDC) has determined that blood lead levels greater than 10 micrograms per deciliter (µg/dL) present an undue risk of damaging health effects (CDC 1991, 1997). For guidance, the CDC has developed the following general policies and activities related to lead poisoning prevention.

- Lead levels less than 10 µg/dL require no additional action unless exposure sources change. Recommend rescreening in 1 year.
- Lead levels in the 10-14 µg/dL range indicate exposure in a community. Recommend family lead education and follow-up testing.

- Levels of 15-19 µg/dL indicate lead adsorption and require educational and nutritional intervention and more frequent screening.
- Levels of 20-44 µg/dL require medical and environmental intervention and perhaps chelation.
- Levels of 45 µg/dL or higher require environmental and medical intervention with chelation therapy.

Blood lead levels have been monitored in the populated areas of the BHSS since 1974. The available data are presented chronologically in Figure 6.1-1. These data record declines in arithmetic mean blood lead levels of nearly 70 µg/dL in certain populated areas of the BHSS to less than 10 µg/dL over approximately 25 years of blood lead health intervention and remedial activities (Van Lindern 2000a). As shown, since the inception of remedial activities in 1989, blood lead levels have decreased by 70 percent in Smelterville (from 14.2 to 4.3 µg/dL), 58 percent in Kellogg (from 10.8 to 4.5 µg/dL), 55 percent in Wardner (from 11.8 to 5.4 µg/dL), 67 percent in Page (12.5 to 4.1 µg/dL), and 33 percent in Pinehurst (7.4 to 5.0 µg/dL).

Figure 6.1-2 shows the decline in the percentage of children in the BHSS whose blood levels were above 10 µg/dL. This figure shows the clear relationship between yard remediation, which began in 1989, and decreasing blood lead in children. It also shows that the soil and source material RAO (95 percent of children with blood lead below 10 µg/dL) was achieved in the BHSS by 1999.

The declining blood lead levels that have occurred in the BHSS provide validation to and confidence in the human health remedies implemented, namely, health education and intervention programs, vacuum loan programs, and residential and common use soil removal and replacement actions. The successful declining blood lead results achieved at the BHSS provide valuable lessons for future human health actions outside the area.

The results of additional state and local public health surveys conducted in the basin (outside the BHSS) since 1996 indicate consistent excessive levels of lead absorption in children with little problem identified among adults (although specific data are not available for pregnant women). Table 6.1-1, taken from the human health risk assessment (TerraGraphics and URSG 2000), summarizes the blood lead levels measured in these surveys for 0- to 6-year-old children.

Site-specific analysis of blood lead data paired with environmental lead data suggests complex exposure pathways. Blood lead levels appear to be most closely related to lead in house dust, followed by independent effects of lead in yard soil, the condition of interior lead-based paint, and the lead content of exterior paint (TerraGraphics and URSG 2000). High blood lead levels in the lower basin have been associated with homes that were flooded in 1996, and recreational activities outside the home (TerraGraphics and URSG 2000).

6.1.4 Human Health Risk Assessment

In the human health risk assessment, major population groups were quantitatively evaluated for a variety of exposure pathways, media, contaminants, and geographical areas. The receptors and pathways that were evaluated fall into the following five exposure scenarios:

- Residential—evaluated for children and adults who live in the basin. This evaluation was conducted for a variety of pathways with potential exposure to affected media in the home, in the yard and community, and from homegrown vegetables. In addition, a potential future drinking water evaluation for shallow groundwater in the Burke/Ninemile area was performed.

- Neighborhood recreational—evaluated, in addition to the residential scenario, for community soils incremental exposures for children at play in neighborhood creeks and waste piles.

- Public recreational—evaluated for children and adults who use developed parks and playgrounds, and undeveloped recreational areas whether they are residents or visitors. Exposure scenarios included the incidental ingestion of soils and surface water and the ingestion of fish by sport fishermen.

- Occupational—evaluated for adult construction workers.

- Subsistence—evaluated for children and adults who have potential future traditional or modern subsistence lifestyles.

The risks of the presence of lead and non-lead metals were evaluated separately for each of the scenarios as summarized in the following sections.

6.1.5 Lead Risk Summary

Lead health risk methods are unique owing to the ubiquitous nature of lead exposures and the reliance on blood lead concentrations to describe lead exposure, toxicity, and risks. Lead risks are characterized by predicting blood lead levels with computer models and guidance developed by EPA, available from the following web site:

http:\\www.epa.gov\superfund\programs\lead\prods.htm – software.

In contrast to risk assessment methodologies for cancer or non-cancer risks, lead risk assessments use central tendency exposure values to predict a central tendency (geometric mean) blood lead level. The predicted geometric mean blood lead level is then used in conjunction with a modeled log-normal distribution to estimate the probability of exceeding a target blood lead level of 10 micrograms per deciliter (µg/dL). Blood leads levels are a measure of internal dose

that has been related to many adverse health effects (National Research Council Committee on Measuring Lead in Critical Populations 1993). This emphasis on blood lead integrates exposure, toxicity, and risk, which are separated in other types of risk assessment. For other chemicals, risk is described in terms of an external dose (e.g., mg/kg/day).

The EPA Integrated Exposure Uptake Biokinetic Model (IEUBK) was used to predict blood lead levels in children up to 84 months of age (USEPA 1994b). The EPA Adult Lead Model (ALM) was used to predict blood lead levels in fetuses (USEPA 1996).

As discussed previously, lead health surveys conducted in the basin area by State and local health authorities have noted excessive levels of blood lead in children, with only minor problems among adults. The human health risk assessment explained the contributions that the various exposure pathways and media made to the lead risk by showing the percentages that each pathway or medium would contribute to the average child's exposure. For illustrative purposes, Figure 6.1-3 shows the percentage of lead that an average child would receive from each of the lead sources if all the information in the entire basin were combined. However, this "average child" does not actually exist, and exposures for individual children would be determined by the characteristics of their yard and that child's activities. For example, a child's exposure would vary depending on whether he or she ate homegrown vegetables, or the amount of time he or she spent in the home or playing outside. If a child were to play on waste piles, his exposure to lead would depend on how long he or she played on the pile, and the pile's concentration of lead. To account for the variations among children, the human health risk assessment attempted to estimate the reasonable maximum time a child would engage in each activity. As shown in Figure 6.1-3, the home is the largest contributor to lead exposures for the average child, (at least 50 percent) even if a child receives lead from all other sources in the basin. Thus, the human health risk assessment focused primarily on lead contamination in the media of concern, especially around the home.

Considering the home exposure to be the primary single contributor to the residential lead risk within the basin, Figure 6.1-4 shows a further breakdown of lead exposure within the home, again based on basin-wide averages. This figure indicates that house dust is the major source of home lead exposure, contributing 56 percent, followed by outdoor residential soil, which accounts for 31 percent of lead exposure in the home. (House dust lead concentrations are total lead in dust and thus include all sources of lead, such as interior paint, as well as lead dust from yard and community soils.) Air, drinking water, and typical diet contribute comparatively little to lead exposure in the home.

6.1.6 Non-Lead Metals Risk Summary

For non-lead metals, the human health risk assessment considered two levels of contaminant intake, referred to as the central tendency (CT) and the reasonable maximum exposure (RME). The CT estimate is the most typical level of exposure, while the RME represents the maximum intake that can reasonably be expected.

Health risks for chemicals that cause cancer are calculated differently than those chemicals that cause non-cancer health effects. For non-cancer risks, if a person is exposed to a chemical dose equal to or less than the "threshold," no adverse effects are expected. The "hazard quotient" for a chemical is the chemical dose from the site divided by the threshold dose. If the hazard quotient is less than 1, then no adverse effects are anticipated. Cancer risks are calculated assuming that the presence of carcinogens, at any dose, contribute to risk. Risk indices are presented as a probability of developing cancer. A cancer risk level of 1×10^{-6} is equivalent to one person in a million developing cancer. The EPA uses the general risk range of 1×10^{-4} to 1×10^{-6} as a "target range" within which they try to manage risks as part of a Superfund cleanup.

The results of the risk characterization for non-lead metals reported in the human health risk assessment indicate that some exposure areas could pose an unacceptable threat of non-cancer effects for some individuals and exposure media under the RME condition. These include:

- Young children exposed to arsenic in yard soil in the lower basin, the Side Gulches, Osburn, Mullan, and Burke/Ninemile
- Young children exposed to iron in yard soil in the lower basin
- Children/adults exposed to arsenic in yard soil and tap water in the Side Gulches
- Young children and children/adults who could ingest cadmium and zinc in groundwater in Burke/Ninemile in the future (groundwater at Burke/Ninemile is not currently used as a drinking water source)
- Young children and children/adults ingesting cadmium in homegrown vegetables
- All residents and pathways for subsistence lifestyles

A summary of the non-lead metal pathway/exposure scenarios which exceed the target risk goals is presented in Table 6.1-2.

Arsenic is the only carcinogen evaluated at the site. Cancer risk estimates exceeded 1×10^{-6} for all individuals in all exposure areas under the RME condition, and Table 6.1-2 summarizes use scenarios and pathways where the estimated risk exceeds 10^{-4}. For residential scenarios, yard surface soil contributed the most to cancer risk. For residents in the Side Gulches, tap water also contributed significantly to cancer risk. Although tap water was not the primary contributor to cancer risk for residential scenarios, RME cancer risk estimates for tap water exceeded 1×10^{-6} in all exposure areas. This risk is almost entirely due to selected high concentrations of arsenic in scattered private wells. For the Burke/Ninemile future residential scenario, groundwater contributed nearly all of the cancer risk. Depending on the exposure area, one or more of various

media (upland surface soil, soil/sediment, sediment, or waste piles) contributed the most to cancer risk for recreational visitors. Although surface water was never the primary contributor to cancer risk, RME cancer risk estimates for "disturbed" surface water exceeded 1×10^{-6} for recreational scenarios in several exposure areas. Surface/subsurface soil contributed all of the cancer risk for construction workers.

None of the metals evaluated in fish tissues represent a health risk for sport anglers. However, for a traditional subsistence ingestion scenario, for an assumed daily intake of 540 grams per day, health risk goals were exceeded for both perch and northern pike.

Surface soil and sediment contributed the most to hazards and cancer risks for the subsistence scenarios. The current subsistence scenario had similar hazards to those found for the highest residential child exposures. Cancer risks were higher for the current subsistence scenario, but close to those for the highest residential exposures. Hazards and risks for the traditional subsistence scenario were an order of magnitude higher than those for the residential scenario. For the current subsistence scenario, arsenic and iron were the only chemicals with hazard quotients greater than 1, similar to residential hazards. For the traditional scenario, mercury in fish, manganese in soil and sediment, and cadmium in water potatoes also had hazard quotients greater than 1 in addition to arsenic and iron. Hazards from mercury in fish are likely underestimated for subsistence tribal members because they eat the whole fish, not just fillets.

Combinations of the exposure scenarios described above (e.g., child/adult residential plus neighborhood recreational) would result in hazard/risk estimates that are higher than those discussed in this summary. However, combining the risk and hazard numerical results from the scenarios probably overestimates the total numerical hazard/risk for actual residents. For example, child/adult residents are assumed to spend 24 hours per day, 350 days per year at the residence. Assuming that they also regularly spend several hours per day at a neighborhood or public recreational area or are occupationally exposed results in "double counting" (exposure for more than 24 hours per day), which will overestimate hazard/risk. However, it is clear that many of these additional exposure pathways could result in higher total risks than those shown for residential individuals.

6.2 ECOLOGICAL RISKS

To facilitate evaluation of risks, the Basin was divided into five conceptual site model (CSM) units that are differentiated based on geomorphology, habitats, types of waste sources, mechanisms of release and transport of waste, and the natural resources affected by the release of wastes. The CSM units were further subdivided into watersheds and segments The five CSM units are:

- CSM Units 1 and 2, Upper Basin (Figures 1.0-2 and 1.0-3)
- CSM Unit 3, Lower Basin (Figure 1.0-4)

- CSM Unit 4, Coeur d'Alene Lake (Figure 1.0-5)
- CSM Unit 5, Spokane River (Figure 1.0-6)

Three priority issues have been identified as an initial primary focus with respect to ecological protection.

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams.** These metals have harmful effects on aquatic receptors, including fish. [should include back in Section 6 also. Approximately 20 miles of the South Fork and 10 miles of tributaries are unable to sustain reproducing fish populations. Species density and diversity are reduced throughout the Basin, and 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 ESA. The ambient water quality criteria for zinc and cadmium are exceeded throughout the Coeur d'Alene River system downstream of mining impacts, in Coeur d'Alene Lake, and in the Spokane River.

- **Lead in wetlands and floodplains.** Existing lead contamination has harmful effects on waterfowl and plants. Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. The total number of waterfowl dying of lead poisoning has not been estimated, however, 682 dead or sick birds were found in the Basin between 1992 and 1997. The number of waterfowl carcasses found in 1997 represented the largest documented die-off in the Coeur d'Alene River Basin since 1953. 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 at reference sites nationally.

- **Particulate lead in the surface water.** Lead transported downstream in the river system is a continuing source of contamination to 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 warning 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 habitat areas cleaned up as part of the remedy.

An ecological risk assessment was conducted for the Basin that focused on the effects of metals in contaminated media at known source areas on ecological receptors. The ecological receptors evaluated included mammals, birds, fish and other aquatic organisms, amphibians, terrestrial plants, and soil invertebrates and processes. In addition to the direct effects of metals, the

ecological risk assessment also evaluated the effects of physical and biological ecosystem characteristics.

The ecological risk assessment concluded that metals, principally cadmium, lead, and zinc, present significant risks to most ecological receptors throughout the Basin. Few species had no identifiable risks. Some risks were identified for all receptor classes.

Some species present in the Basin are considered to be "special-status species," including those listed as endangered or threatened under the Endangered Species Act (ESA), those listed by the U.S. Fish and Wildlife Service (USFWS) as species of concern, state-listed sensitive plant species, and culturally significant plant species. Examples include the bull trout, westslope cutthroat trout, bald eagle, black tern, gray wolf, lynx, spotted frog, Ute ladies'-tresses, and water potato.

6.2.1 Impacts on Aquatic Receptors

Ranges of metals concentrations in water that have resulted in acute and chronic effects on various salmonids are shown on Figures 6.2-1 and 6.2-2 for cadmium and zinc, respectively. The estimated average concentrations of these metals at selected key locations in the Basin also are shown. The bull trout is listed as threatened under the ESA.

In addition to the direct toxic effects of metals, risks to aquatic receptors also are associated with physical and biological ecosystem characteristics. Increased bank instability, change in stream channel substrate composition and mobility, increased water temperature (from the loss of riparian vegetation along streams), and habitat fragmentation pose a risk to aquatic organisms.

Fish populations and species diversity are degraded in the following segments:

- Upper South Fork Segment 1 (below Mullan)
- Canyon Creek Segments 3, 4, and 5
- Ninemile Creek Segments 2 and 4
- Pine Creek Segments 1 and 3
- South Fork (MidGradient) Segments 1 and 2
- Coeur d'Alene River Segments 1, 2, 3, 4, and 5

6.2.2 Impacts on Waterfowl

Twenty species of migratory waterfowl have been documented to use the Lower Basin. An estimated 13,000 acres of a total of 18,000 acres of wetland habitat contain lead at concentrations that are chronically or acutely toxic to waterfowl (greater than 500 mg/kg and 1,800 mg/kg,

respectively).[3] Migratory birds are protected under the Migratory Bird Treaty Act. Studies of the effects of metals in sediment in the Basin have resulted in the following conclusions. For waterfowl, exposure results primarily from ingestion of sediment.

- All species of migratory bird examined from the mid 1980s to present have documented lead exposure. This represents over 20 species of birds inhabiting the Coeur d'Alene River Basin flood plain. This list includes species at all levels of the food web including waterfowl, birds of prey, and songbirds. The results of these investigations have been published in 14 peer-reviewed manuscripts.

- Lead poisoning not associated with hunting or fishing was the greatest single cause of sickness or death (71.4 percent) in animals found in the Coeur d'Alene River Basin.

- Lead poisoning has been documented in Coeur d'Alene River basin waterfowl during all four seasons and from flood plain habitat stretching from Smelterville to Harrison.

- Eleven species (10 species of migratory birds, 1 species of mammal) have been documented with lead poisoning: Canada goose, tundra swan, trumpeter swan, mallard, American wigeon, northern pintail, canvasback, redhead duck, common goldeneye, wood duck, and meadow vole.

- Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. From 1992-97, lead poisoning associated with the ingestion of contaminated sediments was the primary cause of death in all waterfowl found dead in the Coeur d'Alene Basin. These waterfowl mortality events continue every year since the 1992-97 investigation and have been observed by USFWS including observations as recently as March and April 2001.

- Baseline or reference sites locally, regionally, and nationally have lead poisoning in tundra swans (primarily due to lead shot or sinkers) representing 20-30 percent of the total mortality. In the Coeur d'Alene River Basin, lead poisoning (primarily due to ingestion of contaminated sediments) is responsible for 96 percent of the total mortality.

- There were 13.4 times more tundra swans found sick or dead in the Coeur d'Alene River Basin than an adjacent reference area. There were 34.3 times more

[3] Estimates of remediation areas and associated costs are based on lead concentration of 1,000 mg/kg. The difference in remediation areas based on 500 and 1,000 mg/kg lead is small, and is less than the contingency included in the cost estimate.

Canada geese found sick or dead in the Coeur d'Alene River Basin during spring migration than an adjacent reference area.

- 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 River Basin have not decreased. Therefore, animals dying of lead poisoning due to the ingestion of contaminated soils and sediments is expected to continue.

- The total number of waterfowl dying of lead poisoning has not been estimated. The USFWS has only found a fraction of the total number dead in the >18,000 acres of flood plain habitat that exist in the Coeur d'Alene River basin.

- Between 1992 and 1997, 682 dead or sick birds were found in the Basin

6.3 COEUR D'ALENE LAKE

The beaches and wading areas adjacent to Coeur d'Alene Lake and the Idaho portion of the Spokane River were sampled in 1998 and were found to not exceed risk-based levels for recreational use. People using the 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 for protection of human health.

The water in Coeur d'Alene Lake is also classified as a source of drinking water by the state of Idaho and meets the safe drinking water standard for metals with the only exception found when the Coeur d'Alene River flows are high (e.g., during high spring run-off or during flood events) causing short-term lead concentrations that exceed drinking water standards.

Some questions have been raised by the Coeur d'Alene Tribe and others regarding the need to determine potential risks to humans who eat whole fish and filets taken from fish in the lake. Because metals concentrations are higher in whole fish than in filets, consumption of whole fish would increase risk. Previous fish tissue sampling efforts did not include whole fish from Coeur d'Alene Lake. EPA anticipates conducting additional fish tissue sampling to evaluate the potential risks resulting from eating fish from the lake.

The water in the Lake exceeds the water quality standards for cadmium and zinc and intermittently for lead, posing a potential risk to fish or other aquatic life. The sediments at the bottom of the Lake contain mining contamination. While some dissolution of metals from the sediments into the water column is occurring, existing data show the lake acts as a net sink for cadmium, lead, and zinc (Table 4.2-5). However, it is possible that increased rates of metals

dissolution could occur if anoxic conditions develop in the hypolimnion. Increased metal dissolution from lakebed sediments could impact water quality in the lake and the Spokane River. Anoxic conditions could possibly develop if a substantial increase in biological productivity occurs. In the lake, biological productivity is generally limited by the availability of nutrients, especially phosphorus, although the productivity of phytoplankton may be limited by zinc toxicity.

Several measures have been implemented that have resulted in improvements in lake water quality and decreases in the loads of nutrients discharged into the lake, including:

- In the late 1960s, the direct discharge of tailings into the river was discontinued and settling basins and tailings impoundments were installed.
- In the mid-1970s, improved sewage treatment technologies were installed.
- Forestry best management practices (e.g., control of sediment runoff) have been implemented.
- The fertilizer plant at Bunker Hill ceased discharging.
- Agricultural water quality improvements have been implemented.
- Boat pump-out stations and restrooms at recreation areas have been installed.
- Lake protection educational materials have been distributed to lake shore owners and recreational users.
- Kootenai County has implemented a site disturbance ordinance to control erosion from development sites.

Table 6.3-1 shows historic loads of nutrients (phosphorus and nitrogen) discharged into the lake. From 1975 to 1999, estimated total phosphorus loads into the lake from the Coeur d'Alene River decreased from 98,000 kilograms per year to 49,000 kilograms per year (50 percent decrease) and total nitrogen loads decreased from 1,490,000 kilograms per year to 390,000 kilograms per year (74 percent decrease).

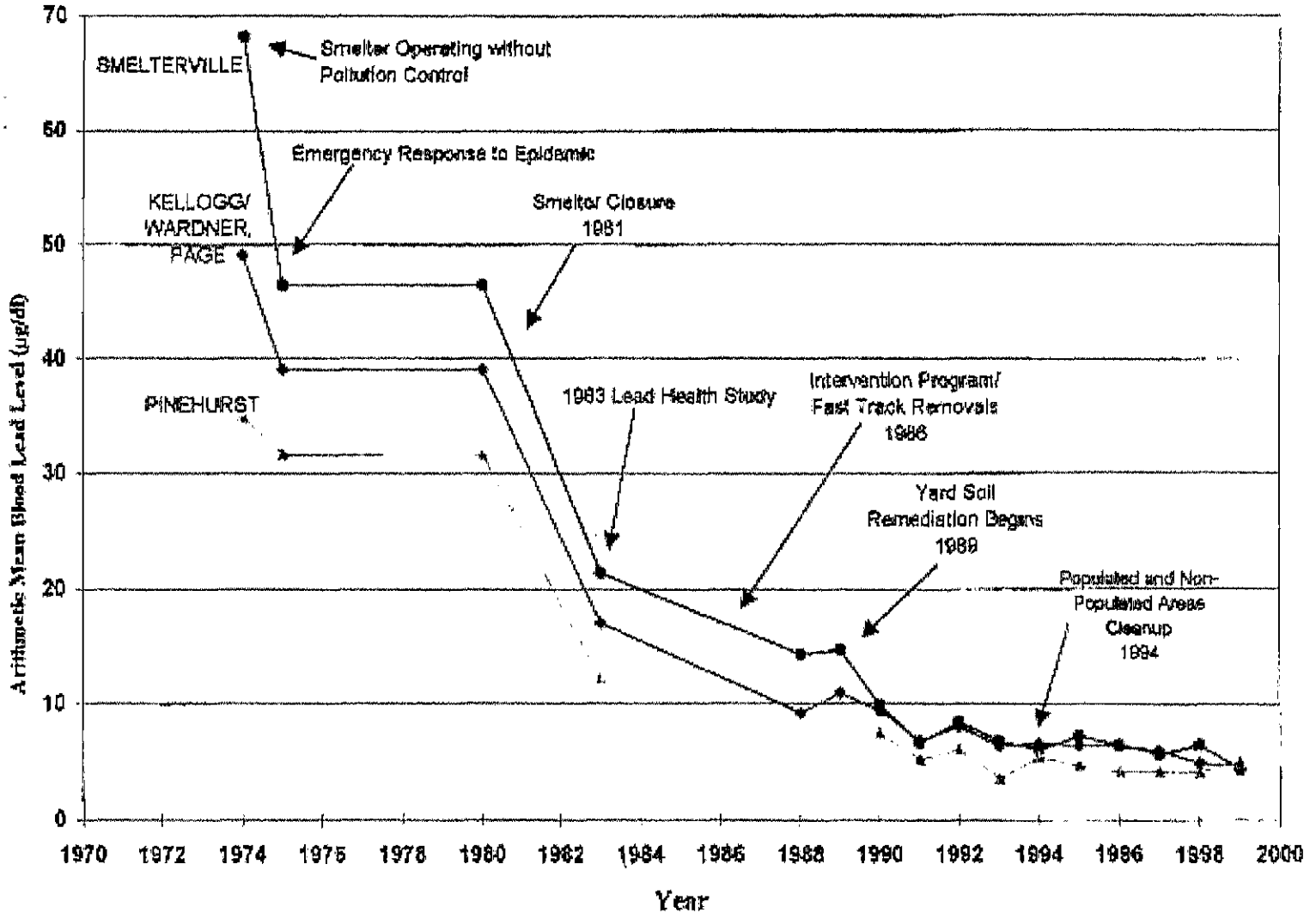
6.4 SPOKANE RIVER

In response to metals contamination, the Washington State Department of Health and Spokane Regional Health District have issued two health advisories for the upper reaches of the Spokane River. The first advisory responds to the presence of elevated lead in shoreline and beach sediments frequented by recreationalists. The second responds to elevated lead concentrations in

fish. Recommended fish consumption limits for children and adults have been established, with particular emphasis toward children and pregnant women or women considering pregnancy.

The AWQC for dissolved zinc, cadmium, and total lead are exceeded in the Spokane River, due to metals that come from the Coeur d'Alene River via Coeur d'Alene Lake. Total lead and cadmium usually only exceed AWQC during and after high discharge periods in the Coeur d'Alene River, when the river carries a large sediment load.

The Spokane Tribe has expressed concerns that the previous studies do not fully account for the metals exposures that may be experienced by tribal members that practice a subsistence lifestyle. The Tribe is planning additional testing and studies to evaluate these exposures.



NOTE:
Taken from Figure 4-1, Final 1999 Five Year Review Report, Bunker Hill Superfund Site, prepared by TerraGraphics Environmental Engineering, April 2000.

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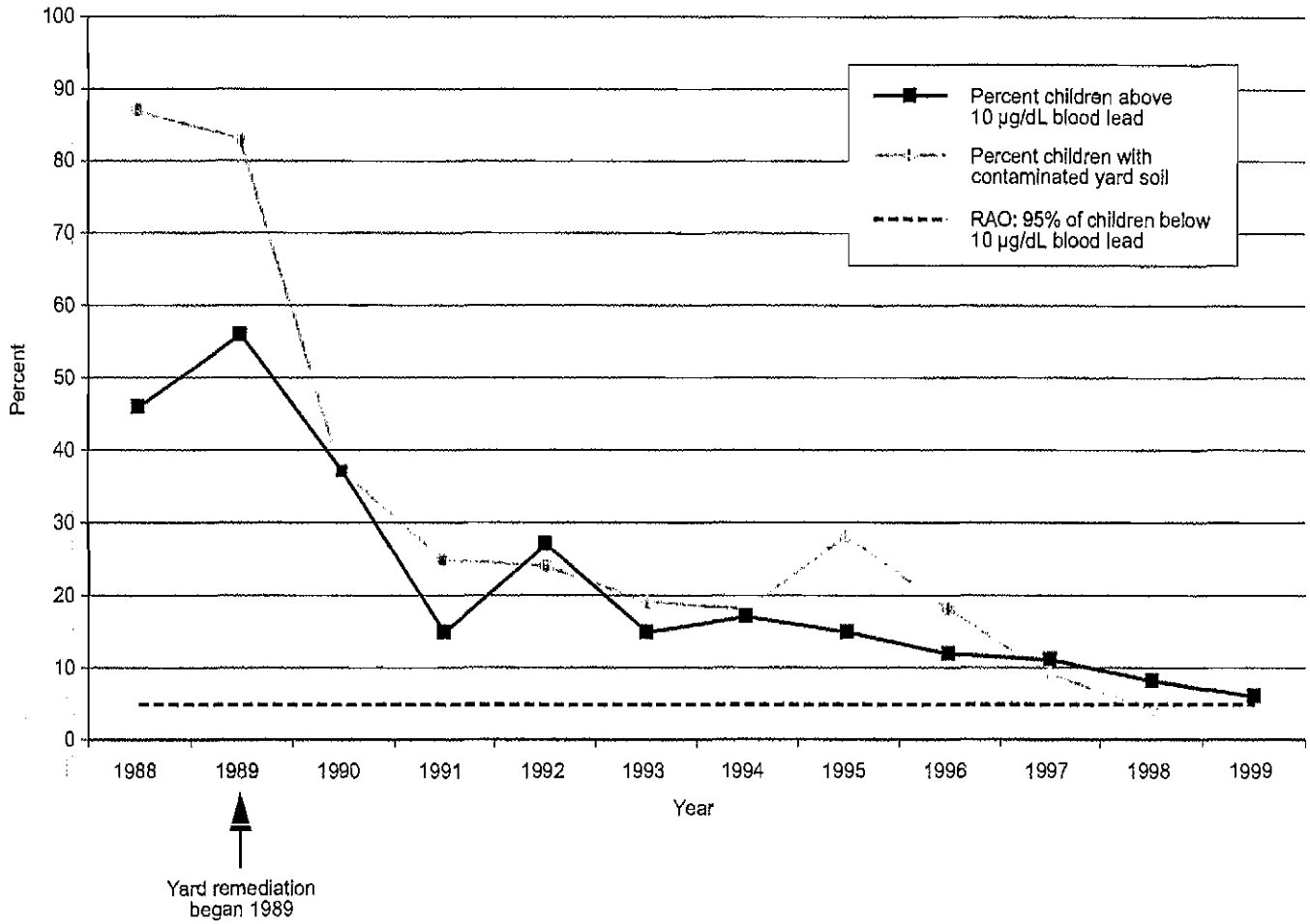
RRB11

Figure 6.1-1
Children's Blood Lead Levels by Year, 1974 - 1999



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

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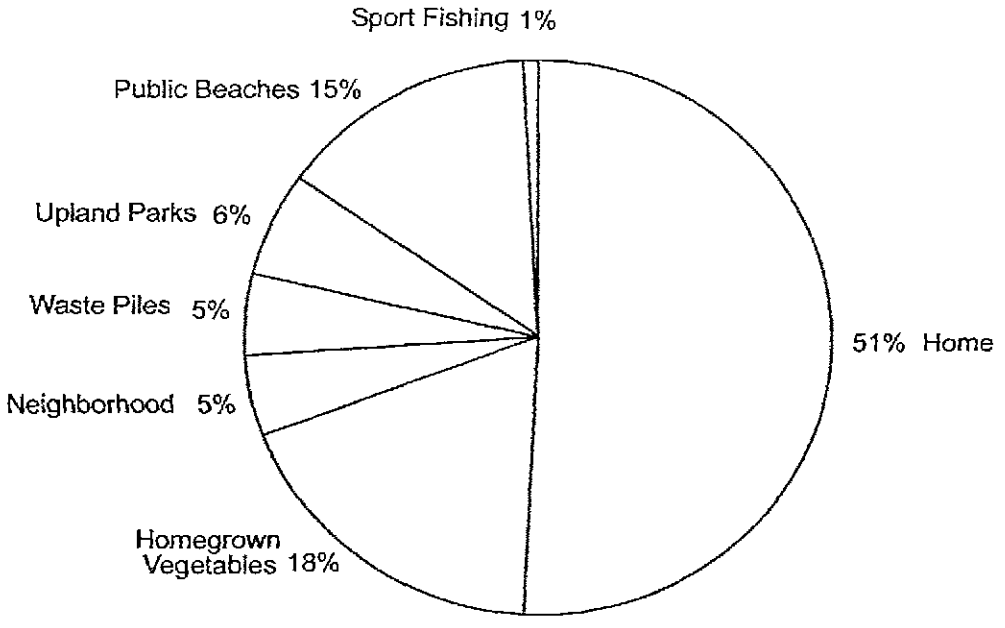
Coeur d'Alene Basin RI/FS
FS PART 1

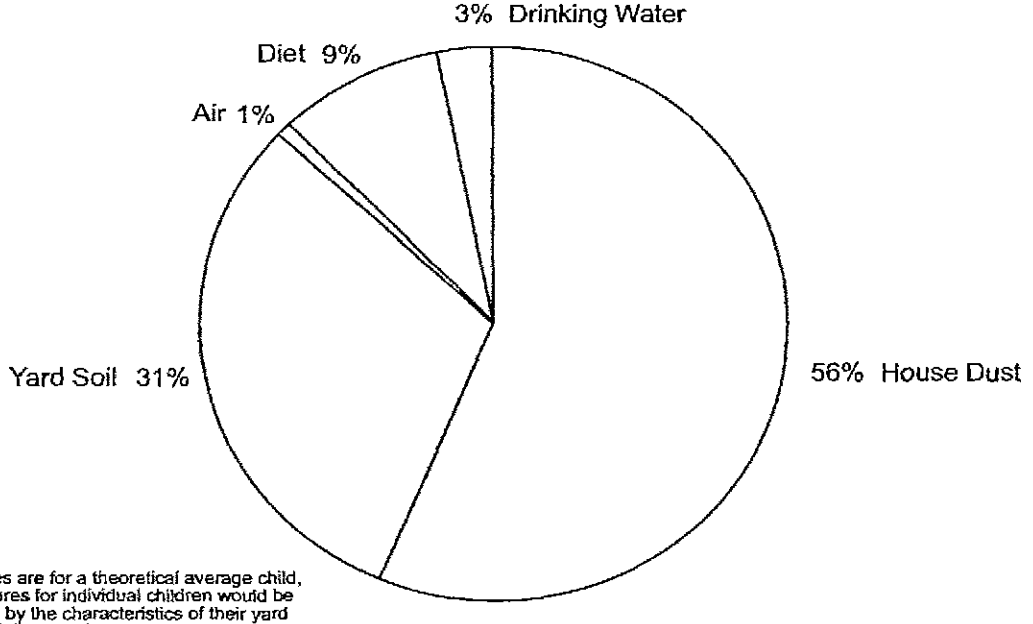
RRB12

Figure 6.1-2
Trends in Children's Blood Lead and Children with Contaminated Yards, Bunker Hill, 1988-1999



NOTE: Percentages are for a theoretical average child, and exposures for individual children would be determined by the characteristics of their yard and that child's activities. Data were compiled from the Human Health Risk Assessment, TerraGraphics, 2000.

Figure 6.1-3
Average Child's Basin-Wide Lead Exposure



NOTE: Percentages are for a theoretical average child, and exposures for individual children would be determined by the characteristics of their yard and that child's activities. Data were compiled from the Human Health Risk Assessment, TerraGraphics, 2000.

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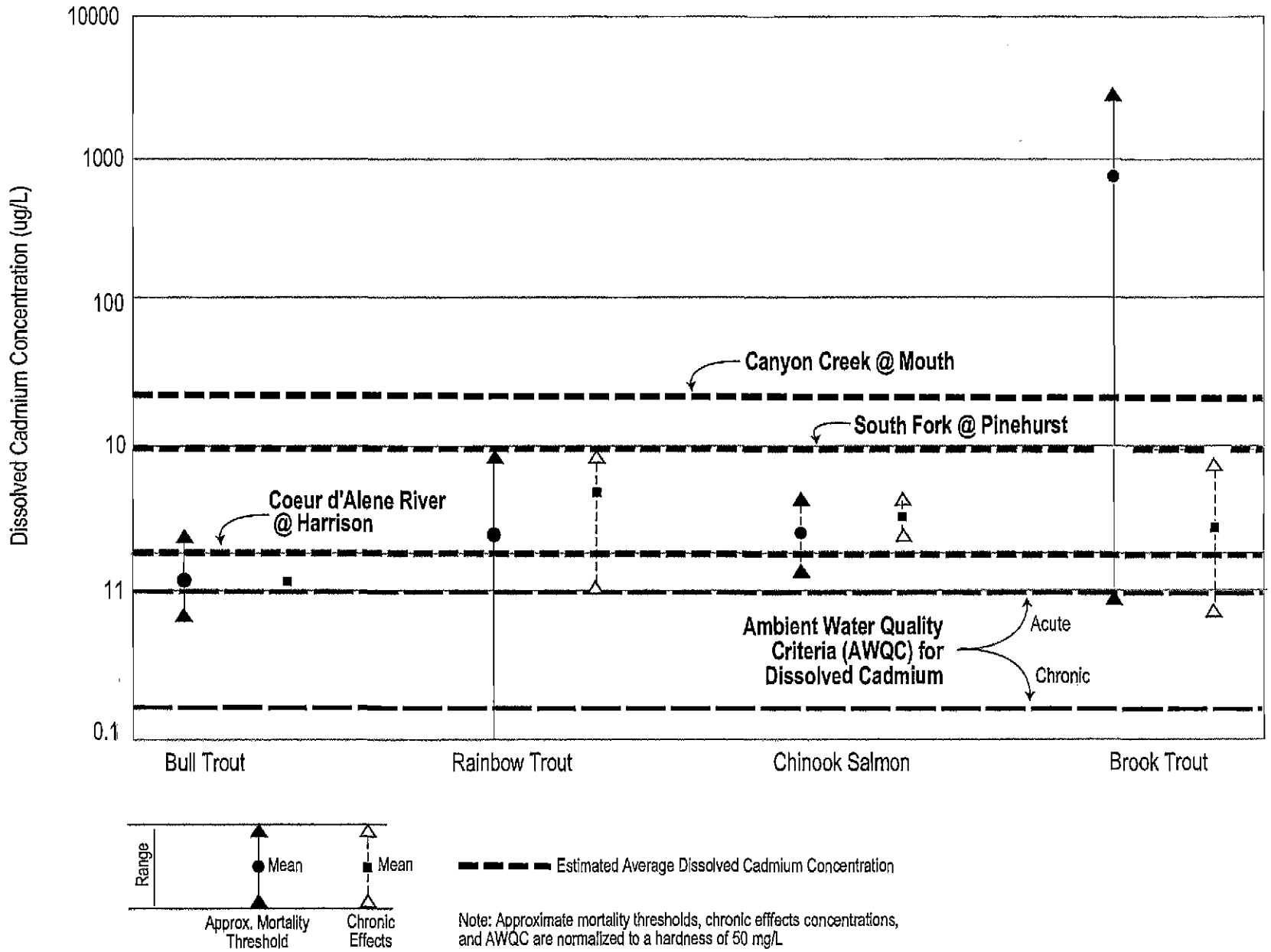
FS PART 1

RRB13

Figure 6.1-4
Average Child's Home Lead Exposure



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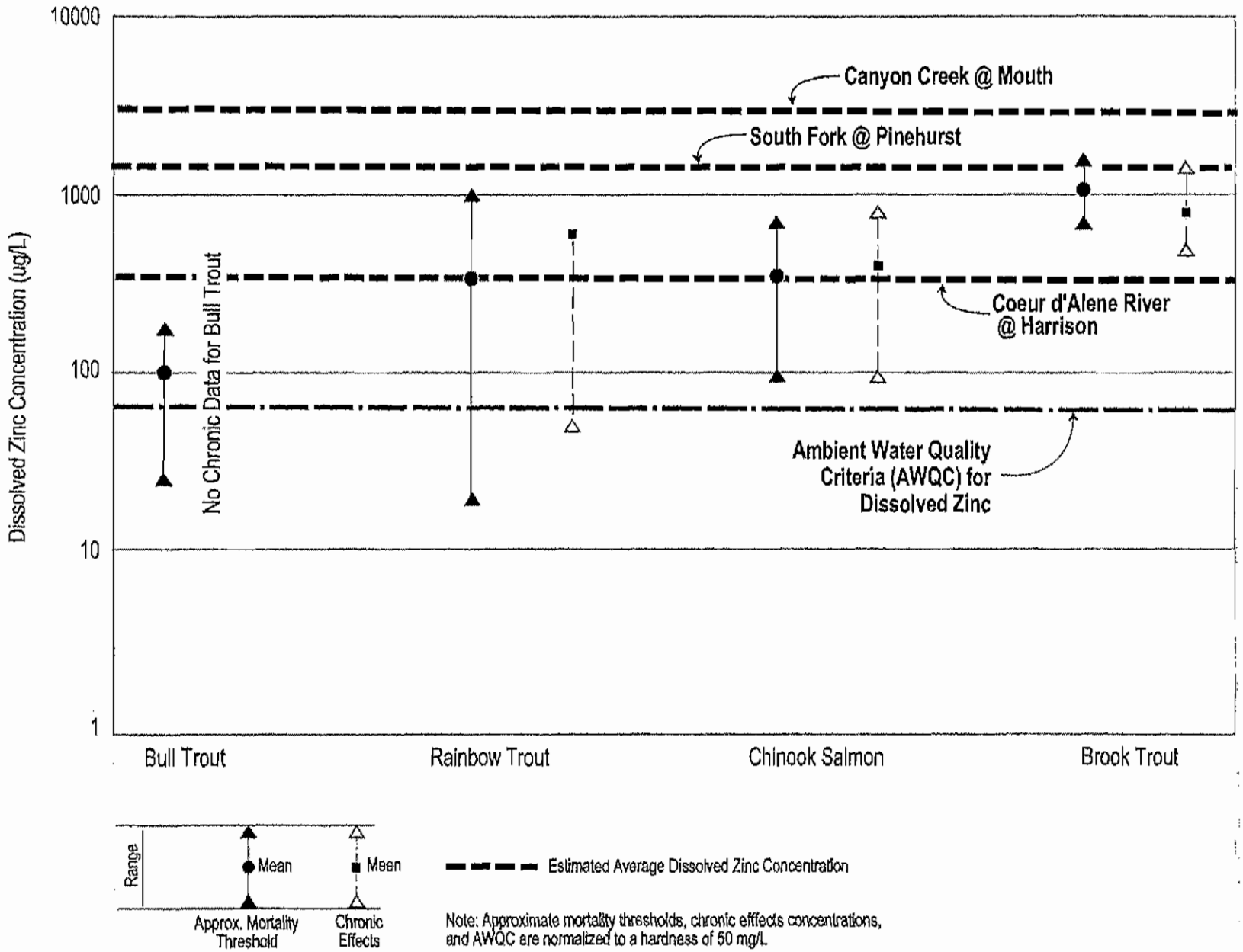
Coeur d'Alene Basin RI/FS
REMEDY REVIEW BOARD

RRB15

Figure 6.2-1
Preliminary Draft Cadmium Acute and Chronic Effects Concentrations for Selected Salmonids



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REMEDY REVIEW BOARD

RRB14

Figure 6.2-2
Preliminary Draft Zinc Acute and Chronic Effects Concentrations for Selected Salmonids

Table 6.1-1
Basin Blood Lead Levels for 1-6 Year Old Children, All Years Combined

Age (years)	N	Percent Participation	Cumulative Percent	Measured Blood Lead Level, µg/dL					# ≥ 10 µg/dL	% ≥ 10	Age-Adjusted % ≥ 10	# ≥ 15 µg/dL	% ≥ 15 µg/dL	Age-Adjusted % ≥ 15
				Minimum	Maximum	Arithmetic Mean	Standard Deviation	Geometric Mean						
1	40	13.2%	13.2%	2	16	7.0	3.6	6.2	8	20.0%	25.3%	2	5.0%	6.3%
2	46	15.2%	28.4%	2	29	8.0	6.3	6.3	12	26.1%	28.6%	8	17.4%	19.1%
3	52	17.2%	45.5%	1	21	6.5	4.5	5.2	10	19.2%	18.7%	4	7.7%	7.5%
4	57	18.8%	64.4%	1	21	5.5	4.2	4.4	7	12.3%	10.9%	3	5.3%	4.7%
5	62	20.5%	84.8%	1	16	5.4	3.0	4.7	5	8.1%	6.6%	2	3.2%	2.6%
6	46	15.2%	100.0%	1	20	4.8	3.3	4.0	3	6.5%	7.2%	1	2.2%	2.4%
All	303	100%		1	29	5.3	4.0	4.2	45	14.9%	16.2%	20	6.6%	7.1%

Table 6.1-2
Reasonable Maximum Exposure Risk from Non-Lead Contaminants[a]

RME HAZARD INDEX EXCEEDS 1[b]

Receptor/Pathway/Contaminant/Medium	RME HI[c]
Residential Scenario	
Young children exposed to arsenic in yard soil	
Lower Basin	2
Side Gulches	2.2
Osburn	2
Mullan	2
Burke/Ninemile	2
Young children exposed to iron in yard soil, Lower Basin	2
Children/Adults exposed to arsenic in yard soil and tap water, Side Gulches	1.6
Young children ingesting cadmium in potential future groundwater used as drinking water, Burke/Ninemile	17
Young children ingesting zinc in potential future groundwater used as drinking water, Burke/Ninemile	4
Children/Adults ingesting cadmium in potential future groundwater used as drinking water, Burke/Ninemile	9
Children/Adults ingesting zinc in potential future groundwater used as drinking water, Burke/Ninemile	2
Young children ingesting cadmium in homegrown vegetables, all areas	2
Children/Adults ingesting cadmium in homegrown vegetables, all areas	2
Children, all pathways, potential future modern subsistence lifestyles, any area	10
Subsistence Scenario	
Children/Adults, all pathways, potential future modern subsistence lifestyles, any area	4
Adults, all pathways, potential future modern subsistence lifestyles, any area	3
Children, all pathways, potential future traditional subsistence lifestyles, any area	49
Children/Adults, all pathways, potential future traditional subsistence lifestyles, any area	21
Adults, all pathways, potential future traditional subsistence lifestyles, any area[d,e]	10

RME CANCER RISK EXCEEDS 1 X 10^{-4} (Arsenic is the only carcinogenic COPC)[f]

Receptor/Pathway/Medium	RME CR[g]
Residential Scenario[h]	
Child/Adult, yard soil and tap water	3×10^{-4}
Child/Adult, yard soil only	1.2×10^{-4}
Child/Adult, tap water soil only	1.9×10^{-4}
Modern Subsistence Scenario (potential future)[d]	
Total (any area, child/adult)	8×10^{-4}
Child/Adult, incidental ingestion of surface soil	2×10^{-4}
Child/Adult, dermal exposure to sediment	2×10^{-4}
Child/Adult, incidental ingestion of sediment	2×10^{-4}
Child/Adult, ingestion of surface water	2×10^{-4}
Traditional Subsistence Scenario (potential future)[e]	
Total (any area, child/adult)	4×10^{-3}
Child/Adult, dermal exposure to surface soil	2×10^{-4}
Child/Adult, incidental ingestion of surface soil	1×10^{-3}
Child/Adult, dermal exposure to sediment	7×10^{-4}
Child/Adult, incidental ingestion of sediment	6×10^{-4}
Child/Adult, ingestion of surface water	1×10^{-3}

Table 6.1-2 (Continued)
Reasonable Maximum Exposure Risk from Non-Lead Contaminants[a]

Notes:
[a] From pages 5-10 and 5-11 human health risk assessment (Terragraphics and URSG 2000)
[b] From Table 5-1, human health risk assessment (Terragraphics and URSG 2000)
[c] HI = hazard index (greater than 1, adverse health effects expected)
[d] From Table 5-4, human health risk assessment (Terragraphics and URSG 2000)
[e] From Table 5-5, human health risk assessment (Terragraphics and URSG 2000)
[f] From Table 5-5, human health risk assessment (Terragraphics and URSG 2000)
[g] CR = cancer risk

Table 6.3-1
Historic Loads of Total Phosphorus and Total Nitrogen to Coeur d'Alene Lake

Load Source	1975 loads[1]		1991 loads[2]		1999 loads[3]	
	TP	TN	TP	TN	TP	TN
Coeur d'Alene River	98,100	1,490,000	22,000	800,000	49,000	349,000
St. Joe River	56,300	1,480,000	72,100	1,040,000	20,600	253,000
Other	25,600	430,000	38,900	429,000	NR	NR
Total to Lake	180,000	3,400,000	133,000	2,270,000	NR	NR

All values expressed in kilograms
[1] From USEPA (1977); loadings based on long-term annual mean discharge
[2] From Woods and Beckwith (1997); annual discharge was about 130% of average
[3] From Woods (2000); annual discharge was about 120% of average

Notes:
NR - not reported
TN - total nitrogen
TP - total phosphorus

7.0 REMEDIAL ACTION OBJECTIVES, PRELIMINARY REMEDIAL GOALS, AND APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section identifies the objectives of the comprehensive remedial actions in the Coeur d'Alene Basin. RAOs provide a general description of what a CERCLA cleanup would be designed to accomplish (USEPA 1988).

7.1 BASIN-WIDE HUMAN HEALTH RAOS

RAOs developed for protection of human health in the Coeur d'Alene Basin are identified in Table 7.1-1. The RAOs for groundwater protection are not fully developed due to a lack of data concerning the extent of groundwater contamination.

7.2 BASIN-WIDE ECOLOGICAL RAOS

The RAOs for protection of ecological receptors are identified in Table 7.2-1. Many of the RAOs are based on achieving a remediation goal, or cleanup level, which is a concentration of a chemical in a specific medium. Table 7.2-2 shows the preliminary remediation goals (PRGs) for chemicals of concern in soil, sediment, surface water, and groundwater for protection of ecological receptors. PRGs for surface water are equal to the AWQC (for fish and other aquatic organisms) or the concentration determined by the risk assessment to be potentially harmful to aquatic plants, whichever is less. The AWQC depend on the hardness of the water, and increase as the hardness increases. Because there are no Federal or State cleanup levels for soil or sediment contamination, PRGs for these media are based on the most sensitive receptor, as determine by the baseline risk assessment, or the estimated background concentration, whichever is greater. The PRGs for cadmium, lead, and zinc in soil and sediment are all set at the 90th percentile upper confidence limit background concentration (that is, there is a 90 percent likelihood that the true, or actual, background concentration is less than the PRG). The PRGs could be changed as additional information becomes available.

It is unlikely that certain of the RAOs, e.g., meeting TMDLs and AWQCs, would be achieved without an extended period of natural recovery, even if the majority of contamination were removed or contained. However, without active remediation it is estimated that more than 1,000 years would be required to meet RAOs through natural processes alone (URSG 2001).

As discussed earlier, and as part of the preferred Basin-wide comprehensive alternative implementation, EPA plans to develop a set of interim benchmarks. These interim benchmarks would be near-term goals that would serve as landmarks to measure the progress of the remedy toward achievement of the Basin-wide RAOs. As an example, soil and sediment concentration

interim benchmarks may vary depending on specific land use and receptors of concern (e.g., an interim lead benchmark of 500 mg/kg to protect waterfowl in specified wetland areas). These interim benchmarks will be established in the ROD after public input during the comment period. The current preference is to complete cleanup at a watershed or watershed segment level in CSM Units 1 and 2 and to reduce the area of contaminated habitat in CSM 3. Table 7.2-3 provides examples of how interim benchmark RAOs would be identified in the ROD.

7.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Potential chemical-specific ARARs for the Basin-wide remediation are presented in Tables 7.3-1 through 7.3-7. Potential location-specific ARARs are presented in Table 7.3-8. Potential action-specific ARARs are presented in Tables 7.3-9.

Table 7.1-1
Remedial Action Objectives for Protection of Human Health in 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. Prevent the exposure of humans to lead in soil and sediments such that there is a 95% or greater probability that a child or children ages 0 to 84 months have blood lead levels less than 10 µg/dL, and a 1% or lower probability that a child or children ages 0 to 84 months have blood lead levels greater than 15 µg/dL.[a] Prevent direct human exposure to soils and sediments (ingestion, inhalation, and dermal contact) that: • Would produce excess cancer risks greater than 1×10^{-6} OR • Have concentrations of COPCs greater than selected PRGs for soil.
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 COPCs for drinking water exceeding selected PRGs for drinking water.
House Dust	Prevent the introduction of lead to residences from areas outside the home via tracking and air pathways so that there is a 95% or greater probability that a child or children ages 0 to 84 months have blood lead levels less than 10 µg/dL, and a 1% or lower probability that a child or children ages 0 to 84 months have blood lead levels greater than 15 µg/dL.[a]
Fish Consumption	Prevent ingestion by humans of aquatic organisms from surface waters containing contaminants of concern exceeding risk-based threshold concentrations
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 COPCs greater than rural northern Idaho background levels.

[a]Development of these objectives are based on directives by EPA OSWER as presented in Appendix D of the FS Part 2 (TerraGraphics and URSG 2000).

Notes:
NAAQS – National Ambient Air Quality Standards
OSWER – Office of Solid Waste and Emergency Response
TSP – total suspended particulates
µg/dL – micrograms per deciliter

Table 7.2-1
Remedial Action Objectives for Protection of Ecological Receptors in the Coeur d'Alene Basin

Subject	Remedial Action Objective
Ecosystem and physical structure and function	Remediate soil, sediment, water quality, and habitat so that it is capable of supporting a functional ecosystem for the aquatic and terrestrial plant and animal populations in the Coeur d'Alene Basin Maintain (or provide) soil, sediment, water quality, and habitat supportive of individuals of special-status biota that are protected under the Endangered Species Act and the Migratory Bird Treaty Act
Soil, sediment and source materials	Prevent ingestion of arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that exceed ecological PRGs Reduce loadings of metals from soils and sediments to surface water so that loadings do not cause exceedances of surface water PRGs Prevent transport of metals from soils and sediments to groundwater at concentrations that exceed surface water PRGs Prevent dermal contact with arsenic, cadmium, copper, lead, mercury, silver, and zinc by ecological receptors at concentrations that exceed ecological PRGs
Mine water seeps, springs, and leachate	Prevent discharge of seeps, springs, and leachate to surface water at concentrations that exceed surface water PRGs
Surface water	Prevent ingestion of cadmium, copper, lead, and zinc by ecological receptors at concentrations that exceed surface water PRGs Prevent dermal contact with cadmium, copper, lead, and zinc by ecological receptors at concentrations that exceed ambient water quality criteria or state or tribal water quality standards
Groundwater	Prevent discharge of groundwater to surface water at concentrations of cadmium, copper, lead, and zinc that exceed surface water PRGs

Table 7.2-2
Preliminary Remediation Goals (PRGs) Established in the Ecological Risk Assessment

Chemical	Soil (mg/kg)	Sediment (mg/kg)	Surface Water Dissolved (µg/L)[a]	Groundwater Dissolved (µg/L)[b]
Arsenic	22	22	NA	NA
Cadmium	2.86	2.86	0.9	0.9
Copper	53	53	1.0	1.0
Lead	175	175	0.66	0.66
Mercury	NA	0.3	NA	NA
Silver	NA	1.1	NA	NA
Zinc	280	280	30	30

based on aquatic plants • not hardness dep. • based on totals

[a] PRGs for cadmium and lead are equal to the ambient water quality criteria, which are dependent on water hardness. The PRGs shown are for a hardness of 30 milligrams per liter, which is typical of the lower range of hardness values in the Coeur d'Alene Basin. The PRGs for copper and zinc are based on protection of aquatic plants.

[b] Groundwater PRGs for cadmium, copper, lead, and zinc are set equal to the surface water PRGs in order to meet the surface water PRGs. No dilution was assumed because metals concentrations in surface water currently exceed PRGs in the Basin.

Notes:

Soil/sediment PRGs reflect the most sensitive receptor or background, whichever is higher. Interim benchmarks will be receptor-specific based on anticipated land use (e.g., agricultural vs. wetland).

NA: not a chemical concern in that medium

Table 7.2-3
Examples of Interim Benchmarks for Protection of Ecological Receptors

Receptor/Medium	Goal	Metrics
Fish and other aquatic organisms	Achieve sustainable fisheries in selected areas (i.e., East Fork Ninemile Creek and Pine Creek) of the Upper Basin	Fish density Number of species Presence of young-of-the-year
Waterfowl	Reduce waterfowl mortality through cleanup of 17% of habitat area	Metal concentrations
Sediment/Surface Water	Reduce transport of particulate lead to floodplains, Coeur d'Alene Lake, and Spokane River through containment or removal of 68% of Lower Basin 100-year floodplain contaminated sediments exceeding 500 mg/kg	Metal concentrations

Table 7.3-1
Potential Chemical-Specific ARARs and TBCs for Ecological Receptors in the Coeur d'Alene Basin

Citation	Federal/ State/Tribal and CSM Unit(s)	Summary of Requirement	Evaluation
Soil			
Model Toxics Control Act regulations (Ch. 173-340 WAC)	Washington CSM Unit 5	Sets forth cleanup levels for soil for residential exposures.	Potentially applicable
MTCA Proposed Ecological Evaluation (Ch. 173-340 WAC)	Washington CSM Unit 5	Provides chemical concentrations that may be used as cleanup levels for ecological sites.	Potential TBC
Surface Water			
Clean Water Act (33 USC 1314); National Toxics Rule (40 CFR 131.36)	Federal All CSM Units	Establishes contaminant thresholds in surface water to protect human health and aquatic organisms. The National Toxics Rule sets forth these standards for states that had failed to fully comply with Section 303(c)(2)(C) of the federal Clean Water Act (CWA).	Potentially applicable when adopted by states and tribes
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Idaho CSM Units 1, 2, and 3	Designates uses for waters of the state and water quality standards protective of those uses. This regulation adopts water quality criteria for individual chemicals based on protection of beneficial uses. April 2000 revisions to regulations have been approved by EPA.	Potentially applicable
Idaho Water Quality Standards and Wastewater Treatment Requirements—Salmonid Sight Feeding Standard (IDAPA 58.01.02.250)	Idaho CSM Units 1, 2, and 3	This standard (50 NT acute and 25 NT chronic above background) is often used to assess the effectiveness of erosion abatement efforts.	Potentially applicable
National Recommended Water Quality Criteria—Correction, April 1999 (USEPA 1999) (Clean Water Act, 33 USC 1314)	Federal All CSM Units	Ambient water quality criteria for protection of human health and aquatic life, developed as guidance for states. Revised in December 1998 to reflect the latest scientific knowledge (corrected in April 1999).	Potentially relevant and appropriate
Total Maximum Daily Load (TMDL) for Coeur d'Alene Basin (USEPA and IDEQ 2000)	Federal CSM Units 1, 2, and 3	Establishes TMDLs for dissolved lead, cadmium, and zinc water-quality-impaired stretches of the Coeur d'Alene basin.	Potential TBC
Washington Surface Water Quality Standards (Ch. 173-201A WAC)	Washington CSM Unit 5	Washington's toxics standard for protection of aquatic life; applicable to all beneficial uses of surface water.	Potentially applicable
Sediment			
Creation and Analysis of Freshwater Sediment Quality Values in Washington State (Cubbage et al. 1997)	Washington CSM Unit 5	Provides numeric freshwater sediment quality values for organics and metals in sediments to be considered as thresholds for detecting biological effects	Potential TBC
NOAA Freshwater Sediment Benchmarks (Buchman 1999)	Federal All CSM Units	NOAA's Screening Quick Reference Tables (SquiRTs) include screening concentrations for inorganics in freshwater sediments.	Potential TBC
Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 1999)	Federal All CSM Units	Used to update PRGs for sediments in CSM Units 1, 2, and 3.	Potential TBC

Table 7.3-1 (Continued)
Potential Chemical-Specific ARARs and TBCs for Ecological Receptors in the Coeur d'Alene Basin

Notes:
ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
CWA - Clean Water Act
FR - Federal Register
IDAPA - Idaho Department of Administration, Administrative Rules
NOAA - National Oceanic and Atmospheric Administration
NTR - National Toxics Rule
OSWER - Office of Solid Waste and Emergency Response
ppm - parts per million
PRGs - preliminary remedial goals
TBC - to be considered
TMDLs - total maximum daily loads
USC - U.S. Code

Table 7.3-2
Potential ARARS for Soil in CSM Unit 5 (State of Washington) (mg/kg)

Metal	MTCA Method B – Residential [a]
Arsenic	1.67
Cadmium	80
Copper	2,960
Mercury	24
Lead	None [b]
Zinc	24,000

[a] Washington State Model Toxics Control Act, Ch. 173-340-740 WAC
[b] There is no Method B value for lead; the Method A value is 250 mg/kg

Notes:
ARARS – applicable or relevant and appropriate requirements
CSM - Conceptual Site Model
MTCA – Model Toxics Control Act

Table 7.3-3
Potential Chemical-Specific ARARs for Groundwater as Drinking Water (µg/L)

Metal	MCL [a]	MCLG
Arsenic	50 [b]	None
Cadmium	5	5
Copper	1,300	1,300 [c]
Lead	15 [c]	Zero
Mercury	2	2
Zinc	None	None

[a] Primary drinking water standards only (secondary standards are for protection of aesthetic qualities of water).
[b] EPA has proposed to lower the MCL for arsenic to 5 µg/L. The proposed MCLG is zero.
[c] Action level at the tap.

Source: USEPA 2000

Table 7.3-4
Potential ARARs for Protection of Aquatic Life in Surface Water in CSM Units 1, 2, and 3

Metal	Federal Ambient Water Quality Criteria[a]						Idaho Water Quality Standards[a]						Coeur d'Alene Tribe Water Quality Standards[a,c]					
	Acute			Chronic			Acute			Chronic			Acute			Chronic		
Hardness[b]	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100
Arsenic	340	340	340	150	150	150	50	50	50	50	50	50	360	360	360	190	190	190
Cadmium	1.2	2.0	4.3	0.9	1.3	2.2	1.0	1.7	3.7	0.40	0.60	1.0	1.0	1.7	3.7	1.0	1.7	1.0
Copper	4.3	7.0	13	3.2	5.0	9.0	5.5	8.9	17	4.06	6.3	11	5.5	8.9	17	5.5	8.9	11
Lead	17	30	65	0.66	1.1	2.5	17.0	30.1	65	0.66	1.2	2.5	17	30	65	0.66	1.1	2.5
Mercury	1.4	1.4	1.4	0.77	0.77	0.77	42	2.1	2.1	0.012	0.012	0.012	2.1	2.1	2.1	0.012	0.012	0.012
Zinc	43	65	120	43	65	120	41	64	110	38	58.1	100	41	64	110	38	58.1	100

[a]Standards and criteria in micrograms per liter (µg/L)
[b]Hardness in milligrams of calcium per liter ($mgCaCO_3/L$)
[c]Tribal ARARs and TBCs apply only on reservation lands.

Notes:

Coeur d'Alene Tribe uses actual hardness for calculations, so if hardness is <25, then tribal standards are more stringent.

These ARARs are also the PRGs for protection of aquatic life in surface water in CSM Units 1, 2, and 3.

Table 7.3-5
Federal Ambient Water Quality Criteria for Dissolved Cadmium, Lead, and Zinc at Measured Hardnesses and Corresponding TMDLs for Specific Water Bodies in the Coeur d'Alene Basin[a]

Target Site	Flow Tier (cfs)	River Hardness (mg/L as $CaCO_3$)	Dissolved Cadmium (µg/L)	TMDL for Dissolved Cadmium (lb/day)	Dissolved Lead (µg/L)	TMDL for Dissolved Lead (lb/day)	Dissolved Zinc (µg/L)	TMDL for Dissolved Zinc (lb/day)
South Fork at Wallace	22	57	0.68	0.0811	1.36	0.162	65	0.00904
	35	56	0.67	0.0127	1.33	0.251	64	0.00339
	79	47	0.59	0.251	1.10	0.467	55	0.0467
	469	25	0.37	0.934	0.54	1.37	32	0.226
Canyon Creek	7	56	0.67	0.0257	1.33	0.0510	64	2.45
	11	56	0.67	0.0398	1.33	0.0790	64	3.79
	25	45	0.57	0.0770	1.05	0.141	53	7.16
	149	25	0.37	0.297	0.54	0.435	32	25.9
Ninemile Creek	2	73	0.82	0.00881	1.78	0.0192	80	0.863
	3	73	0.82	0.0132	1.78	0.0289	80	1.30
	6.9	63	0.73	0.0273	1.52	0.0564	71	2.63
	41	36	0.48	0.107	0.81	0.180	44	9.72
Pine Creek	20	25	0.37	0.0398	0.54	0.0584	32	3.48
	29	25	0.37	0.0578	0.54	0.0846	32	5.05
	80	25	0.37	0.159	0.54	0.233	32	13.9
	387	25	0.37	0.771	0.54	1.13	32	67.4
South Fork at Pinehurst	68	101	1.00	0.381	2.54	0.933	105	38.7
	97	96	1.00	0.523	2.40	1.26	101	52.8
	268	71	0.80	1.16	1.73	2.50	78	113
	1,290	28	0.40	2.80	0.62	4.28	36	247
Coeur d'Alene at Harrison	239	47	0.59	0.760	1.10	1.41	55	71.0
	348	45	0.57	1.07	1.05	1.96	53	99.7
	1,100	36	0.48	2.87	0.81	4.83	44	261
	6,870	25	0.37	13.7	0.54	20.0	32	1,200
Spokane River	NA	20	0.31	None	0.42	None	27	None

Table 7.3-5 (Continued)
Federal Ambient Water Quality Criteria for Dissolved Cadmium, Lead, and Zinc at Measured Hardnesses and Corresponding TMDLs for Specific Water Bodies in the Coeur d'Alene Basin[a]

[a]From USEPA and IDEQ 2000.

Notes:
cfs - cubic feet per second
lb - pounds
µg/L - micrograms per liter
mg/L - milligrams per liter
TMDL - total maximum daily load

Table 7.3-6
Potential Surface Water ARARs for Protection of Human Health in CSM Unit 5 (State of Washington)

	Federal Ambient Water Quality Criteria		Washington Water Quality Standards[c]		Spokane Tribe Water Quality Standards	
Metal	Water & Organisms (µg/L)	Organisms Only (µg/L)	Water & Organisms (µg/L)	Organisms Only (µg/L)	Water & Organisms (µg/L)	Organisms Only (µg/L)
Arsenic	0.018[a]	0.14[a]	0.018	0.14	0.018	0.14
Cadmium	[b]	[b]	[d]	[d]	[e]	[e]
Copper	1,300	[b]	Nav	Nav	[e]	[e]
Lead	[b]	[b]	[c]	[c]	[e]	[e]
Mercury	0.050	0.051	0.14	0.15	0.14	0.15
Zinc	9,100	69,000	Nav	Nav	[e]	[e]

[a] EPA is currently reassessing the criteria for arsenic. Upon completion of the reassessment the agency will publish revised criteria as appropriate.
[b] EPA has not calculated a human health criterion for this contaminant.
[c] According to WAC 173-201-040(5), human-health-based water quality criteria used by the State and contained in the National Toxics Rule (40 CFR 131.36).
[d] EPA has not promulgated a human health criterion for this contaminant.
[e] The Spokane Tribe has not promulgated a human health criterion for this contaminant.

Note:
Nav - Not available.

Table 7.3-7
Potential ARARs for Protection of Aquatic Life in Surface Water in CSM Unit 5
(State of Washington)

Metal	Federal Ambient Water Quality Criteria[a]						Washington Water Quality Standards[a]						Spokane Tribe Water Quality Standards[a]					
	Acute			Chronic			Acute			Chronic			Acute			Chronic		
Hardness[b]	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100	30	50	100
Arsenic	340	340	340	150	150	150	360	360	360	190	190	190	360	360	360	190	190	190
Cadmium	1.2	2.0	4.3	0.9	1.3	2.2	1.0	1.7	3.7	0.40	0.60	1.0	1.0	1.7	3.7	0.40	0.60	1.0
Copper	4.3	7.0	13	3.2	5.0	9.0	5.5	8.9	17	4.06	6.3	11	5.5	8.9	17	4.06	6.3	11
Lead	17	30	64	0.66	1.1	2.5	17.0	30.1	65	0.66	1.2	2.5	17.0	30.1	65	0.66	1.1	2.5
Mercury	1.4	1.4	1.4	0.77	0.77	0.77	2.1	2.1	2.1	0.012	0.012	0.012	2.1	2.1	2.1	0.012	0.012	0.012
Zinc	43	65	117	43	65	117	41	64	110	38	58.1	100	41	64	110	38	58.1	100

[a] Standards and criteria in micrograms per liter (µg/L)
[b] Hardness in milligrams of calcium per liter ($mgCaCO_3/L$)

Note: These potential ARARs are also the PRGs for protection of aquatic life in surface water in CSM Unit 5.

Table 7.3-8
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Federal (All CSM Units)		
American Indian Religious Freedom Act (42 USC 1996 et seq.)	Protects religious, ceremonial, and burial sites and the free practice of religions by Native American groups.	Potentially applicable
Native American Graves Protection and Repatriation Act (25 USC 3001 et seq., 43 CFR 10)	Protects Native American burial sites and funerary objects. If Native American graves are discovered within remediation areas, project activities must cease and consultation must take place between the Department of Interior and the affected tribe.	Potentially applicable
National Historic Preservation Act [16 USC 470 et seq.; 36 CFR Parts 60, 63, 800; 40 CFR 6.301(b)]	Federal agencies must identify possible effects of proposed remedial activities on historic properties (cultural resources). If historic properties or landmarks eligible for, or included in, the National Register of Historic Places exist within remediation areas, remediation activities must be designed to minimize the effect on such properties or landmarks.	Potentially applicable
Archeological and Historic Preservation Act [16 USC 469 et seq., 40 CFR 6.301(c)]	Establishes procedures to provide for preservation of historical and archaeological data that might be destroyed through alteration of terrain as a result of federal construction project or a federally licensed activity or program.	Potentially relevant and appropriate if site contains historical or archaeological data. Presence or absence of such data on the site must be verified. If historical or archaeological artifacts are present in remediation areas, the remedial actions must be designed to minimize adverse effects on the artifacts.
Migratory Bird Treaty Act (16 USC 703 et seq.)	Protects all species of native, nongame migratory birds from taking without a permit (e.g., lead poisoning of waterfowl due to sediment ingestion). Hunting of migratory birds under a license is a regulated taking.	Potentially relevant and appropriate
Bald and Golden Eagle Protection Act (16 USC 668; 50 CFR 22)	Provides for the protection of the bald eagle and the golden eagle by prohibiting the unpermitted taking, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg [16 USC 668(a); 50 CFR 22]. "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb [16 USC 688(c); 50 CFR 22.3].	Potentially relevant and appropriate
Rivers and Harbors Act of 1899 (33 USC 401 et seq.; 33 CFR 320-330)	Prohibits unauthorized obstruction or alteration of navigable waters.	Potentially applicable

Table 7.3-8 (Continued)
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Federal (All CSM Units) (Continued)		
Clean Water Act (Section 404) - Dredge or Fill Requirements (33 USC 1251-1376; 33 CFR Parts 320-330; 40 CFR Part 230)	Establishes requirements that limit the discharge of dredged or fill material into navigable waters and associated wetlands. EPA guidelines for discharge of dredged or fill materials in 40 CFR Part 230 specify consideration of alternatives that have less adverse impacts and prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardy of threatened or endangered species. Special consideration required for "special aquatic sites" defined to include wetlands.	Potentially applicable. Certain proposed alternatives may result in the temporary or permanent loss of or damage to existing wetlands through dredging and filling activities.
Protection of Wetlands [Executive Order 11990; 40 CFR 6.302(a); 40 CFR Part 6, Appendix A]	Requires federal agencies to take action to avoid adversely impacting wetlands, to minimize wetland destruction, and to preserve the value of wetlands. Also provides for wetlands enhancement and restoration.	Potentially applicable.
Considering Wetlands at CERCLA Site Guidance (OSWER 9280.03, May 1994)	Provides guidance for considering potential impacts of response actions on wetlands at CERCLA sites.	Potential TBC
Protection of Floodplains [Executive Order 11988; 40 CFR 6.302(b); 40 CFR Part 6, Appendix A]	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain.	Potentially applicable where tailings and other wastes are located within the 100-year floodplain.
RCRA: Location Standards for Hazardous Waste Facilities-100 Year Floodplains [42 USC 6901; 40 CFR 264.18(b)]	Hazardous waste treatment, storage, or disposal facilities (TSDFs) located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any 100-year floodplain.	Potentially relevant and appropriate
Idaho (CSM Units 1, 2, and 3 only)		
Idaho Water Quality and Wastewater Treatment—Hazardous and Deleterious Material Storage [Idaho Statute 39-105 and 39-3601 et seq.; IDAPA 58.01.02.800]	Hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters unless adequate measures and controls are provided to ensure that those materials will not enter state waters as a result of high water, precipitation runoff, wind, storage facility failure, accidents in operation, or unauthorized third party activities.	Potentially applicable

Table 7.3-8 (Continued)
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Idaho (CSM Units 1, 2, and 3 only) (Continued)		
Idaho Siting of Hazardous Waste Disposal Facility (Idaho Code 39-5801 et seq.) and Idaho Rules and Standards for Hazardous Waste (IDAPA 58.01.05)	The remedial action will be designed to satisfy some of the technical criteria in the Idaho Hazardous Waste Siting Management Plan as adopted by the Idaho Legislature. Consideration will be given in remedy design to general considerations referenced by the Hazardous Waste Facility Siting Act. However, a siting license for an on-site hazardous waste disposal facility is not required.	Potentially relevant and appropriate
Idaho Lakes Protection Act [Idaho Code 58-104(9) and 58-1301 et seq.; IDAPA 20.03.04]	Requires that the protection of property, navigation, fish and wildlife habitat, aquatic life, recreation, aesthetic beauty and water quality be given due consideration and weighed against the navigational or economic justification for encroachments of beds or waters of navigable lakes of the state	Potentially applicable
Idaho Classification and Protection of Wildlife (Idaho Statute 36-201 and IDAPA 13.01.06)	The Idaho Department of Fish and Game classifies wildlife as game, protected non-game, endangered, threatened, and species of special concern. None of the protected non-game, species of special concern, threatened, or endangered species may be taken or possessed, except as provided by Idaho Fish and Game.	Potentially relevant and appropriate
Idaho Preservation of Historical Sites (Idaho Statute 67-4601 et seq.) and Idaho State Historical Society (Idaho Statute 67-4101 et seq.)	Covers historical sites and historical districts within the state of Idaho and the excavation of archaeological resources. The Idaho State Historical Society is a state agency. It publishes the National Register of Historic Places for Idaho.	Potentially applicable.
Washington (CSM Unit 5 only)		
Washington Shoreline Management Act (Ch. 90.58 RCW; Ch. 173-18, Ch. 173-22, Ch. 173-27 WAC)	Activities within 200 feet of a shoreline of the State with a value of over $2,500 must meet certain requirements.	Potentially applicable
Washington Game Code (Ch. 77-12 RCW; WAC 232-12)	Sets forth state endangered, threatened, sensitive, and other protected species.	Potentially relevant and appropriate
Washington Model Toxics Control Act (Ch. 70.105 RCW; Ch. 173-340 WAC)	Provides cleanup levels for soil, groundwater, surface water; addresses institutional controls.	Potentially applicable
Washington Clean Water Act (Ch. 90.48 RCW; WAC 173-201A)	Provides surface water quality standards for waters of the state.	Potentially applicable

Table 7.3-8 (Continued)
Potential Location-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Washington (CSM Unit 5 only) (Continued)		
Washington Aquatic Lands Management Act (Ch. 79.90.455 RCW; Ch. 332-30)	Contains use authorization and environmental protection requirements for aquatic lands	Potentially applicable
Washington Hydraulics Project Approval (Ch. 75.20.100-160 RCW; Ch. 220-110 WAC)	Requires approval for activities that could affect the flow of waters of the state.	Potentially applicable
Coeur d'Alene Tribe (CSM Unit 3 only)		
Shoreline Protection Act [CDA 25(98), CES Sec. 4[a]]		Potentially applicable, or TBC?

[a] Tribal ARARs and TBCs apply only on reservation lands.

Notes:
ARAR - applicable or relevant and appropriate requirement
CFR - Code of Federal Regulations
Ch. - Chapter
FR - Federal Register
IDAPA – Idaho Department of Administration, Administrative Rules
RCRA - Resource Conservation and Recovery Act
RCW - Revised Code of Washington
TBC - to be considered
USC - U.S. Code
USFWS - U.S. Fish and Wildlife Service
WAC - Washington Administrative Code

Table 7.3-9
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
RCRA Subtitle C—Exemption for Processing and Beneficiation Mining Waste [40 CFR 261.4(b)(7)]	EPA exempts mining wastes as solid waste from the extraction, beneficiation, and processing of ores and minerals, in accordance with the Bevill amendment to RCRA.	Potentially applicable.
RCRA Subtitle C—Hazardous Waste Characteristics (40 CFR 261.20)	Generators of solid waste must determine whether the waste is hazardous. A solid waste is hazardous if it exhibits the toxicity characteristic (based on extraction procedure Method 1311).	Potentially applicable.
RCRA Subtitle C—Hazardous Remediation Waste Management Requirements (HWIR-Media) (40 CFR 264.554)	The use of staging piles can facilitate short-term storage of remediation wastes so that sufficient volumes can be accumulated for shipment to an off-site treatment facility or for efficient on-site treatment. The regulations contain performance standards for these piles.	If contaminated media hazardous waste, potentially applicable; if not, potentially relevant and appropriate.
RCRA Subtitle C—Hazardous Waste Treatment and Storage (40 CFR 264)	Requirements for storing or treating hazardous wastes in tanks, containers, or surface impoundments. Subpart F addresses groundwater monitoring at hazardous waste treatment, storage, or disposal facilities (TSDFs). Closure requirements for hazardous waste repositories are covered under Subpart G. Hazardous waste landfills must meet minimum design standards under Subpart N.	Potentially relevant and appropriate.
RCRA Subtitle C—Treatment Standards for Hazardous Waste Debris (40 CFR 268.45)	Hazardous debris must be treated through identified technologies or standards, unless EPA determines that debris is no longer contaminated, pursuant to 40 CFR 261.3(e)(2)	Potentially applicable
Idaho Rules and Standards for Hazardous Waste-Management of Hazardous Waste (IDAPA 58.01.05 et. seq.) and Land Disposal Restrictions (IDAPA 58.01.05.011)	Hazardous wastes that are generated must be managed in accordance with the generation, and transportation, storage and disposal requirements. LDRs place specific requirements (concentration or treatment) on RCRA hazardous wastes prior to their placement in a land disposal unit.	Potentially relevant and appropriate if any material accumulations are treated ex situ.
RCRA Subtitle D—RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices (42 U.S.C. 6901 et seq.; 40 CFR 257)	Certain criteria are required to be met by solid waste disposal facilities and practices, such as not restricting the base flow of the floodplain, not taking threatened or endangered species, and not causing a discharge to waters of the U.S.	Potentially relevant and appropriate

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
RCRA Subtitle D—Disposal of Nonhazardous Solid Waste (42 U.S.C. 6901 et seq.; 40 CFR Part 258)	Provides criteria for cover material, run-on/run-off control systems, access control, liquid restrictions.	Potentially relevant and appropriate requirement.
Idaho Solid Waste Management Rules and Standards (IDAPA 58.01.06)	Requires all solid waste be managed to prevent human health hazards, public nuisances, or pollution of environment. Elements relating to landfill cover, surface water management, and erosion control may be ARARs.	Potentially applicable or relevant and appropriate.
Mine and Mill Waste Remedial Guidelines and Best Management Practices (CDA Basin Restoration Project)	Design and implementation of selected response actions should consider a number of factors and techniques for protecting water quality, fish and wildlife habitat, while minimizing potential for human exposure.	Potential TBC
Best Management Practices and Guidelines for Mine Tailings Repositories	Provides guidelines for location, design, construction, and management of mine waste repository	Potential TBC
Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 U.S.C. 1201 et seq., 30 CFR 816)	Requires the protection of human health and the environment from the adverse effects of current and past surface coal mining operations. Some of the potentially relevant and appropriate requirements for the removal of contaminated surface soils include: -Stabilization of all exposed surface areas to effectively control erosion and air pollution attendant to erosion (30 CFR 816.95). -Use of best technology currently available to 1) minimize disturbances to and adverse impacts on fish, wildlife, and related environmental values and to achieve enhancement of such if possible; 2) conduct no activity that may jeopardize continued existence of endangered species or that is likely to destroy or adversely modify their critical habitat; and 3) avoid disturbances to, enhance where practicable, or restore or replace wetlands, riparian vegetation, and habitats for fish and wildlife (30 CFR 816.97).	Potentially relevant and appropriate. Although coal mining did not occur in the Coeur d'Alene basin, SMCRA requirements may be relevant and appropriate for cleanup of other types of mining sites.
Idaho Rules Governing Exploration and Surface Mining—Best Management Practices, Reclamation (IDAPA 20.03.02.060, .140, .160)	Reclamation requirements include best management practices for protection of water quality, non-point sediment control, clearing and grubbing operations, overburden and topsoil requirements to enhance revegetation of disturbed areas, and road construction requirements to minimize erosion. Additional best management practices are specified for backfilling and grading and revegetation activities.	Potentially relevant and appropriate.

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Best Management Practices for Soils Treatment Technologies (EPA Office of Solid Waste and Emergency Response, 1997)	Provides technologies for controlling cross-media transfer of contaminants during materials handling activities.	Potential TBC during excavation or contamination of contaminated soils
Mine and Mill Waste Removal Guidelines and Best Management Practices (Coeur d'Alene Basin Restoration Project)	Design and implementation of selected response actions should consider a number of factors and techniques for protecting water quality, fish and wildlife habitat, while minimizing potential for human exposure.	Potential TBC for cleaning up mine wastes in Coeur d'Alene River Basin.
Best Management Practices and Guidelines for Mine Tailings Repositories (Coeur d'Alene Basin Restoration Project, April 27, 1995)	Guidelines for locating design, construction and management of mine waste repository	Potential TBC for the disposal of mining waste in the Coeur d'Alene River Basin
Idaho Mine Tailings Impoundment Structure Rules (IDAPA 37.03.05)	Design elements of the regulation may be relevant and appropriate to construction of regional repositories. Construction, enlargement, and alteration of mine tailings impoundments must conform to specific design specifications, spillways or diversion structures, cutoff walls, filters, and embankment slopes.	Potentially relevant and appropriate.
Coeur d'Alene Tribe Stream Channel Protection Act (CDA 25(98),[a] CES Sec. 4.4); Idaho Stream Channel Alteration Rules (IDAPA 37.03.07)	Contains design standards for work within stream channels, including remedial activities that involve channel alteration.	Potentially applicable

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Clean Water Act/Water Pollution Control Act (33 U.S.C. 1251) Effluent Limitations (Sections 301-302) Water Quality Standards (Section 303) Federal Water Quality Criteria (Section 304) National Performance Standards (Section 306) Toxic and Pre-Treatment Standards (Section 307) National Pollutant Discharge Elimination System (Section 402)	These regulations govern water quality, including water discharged as part of a remedial process. Section 307—Pretreatment regulations under 40 CFR Part 403 provide for limits on discharge to a sanitary sewer system, protecting the municipal system from accepting wastewater that would cause it to exceed its NPDES permit discharge limits. Section 401—Water Quality Certification requires that EPA receive a water quality certification from a state that a given project requiring a federal permit that may result in a discharge to navigable water will comply with the state's water quality standards. Section 402—NPDES establishes a comprehensive framework for addressing stormwater discharges under the NPDES program. Specifies requirements under 40 CFR 122.26 for point source discharge of stormwater from construction sites to surface water and provide for Best Management Practices such as erosion control for removal and management of sediments to prevent run-on and run-off.	Potentially applicable or relevant and appropriate.
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Restrictions are placed on the discharge of wastewaters and on human activities that may adversely affect water quality in state waters. Under IDAPA 58.01.02.800, hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters unless adequate measures and controls are provided to ensure that those materials will not enter state waters. Deleterious materials are defined as any nontoxic substances that may cause the tainting of edible species of fish, taste and odors in drinking water supplies, or the reduction of the usability of water without causing physical injury to water users or aquatic and terrestrial organisms. Nonpoint source activities conducted in a manner that demonstrates a knowledgeable and reasonable effort to minimize resulting adverse water quality impacts are not subject to conditions or legal actions (IDAPA 58.01.02.350.02.a).	Potentially applicable.

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Idaho Non-Point Source Management Plan, Final (December 1999)	Remedial activities should be consistent with the state's goal of restoration, maintenance and protection of the beneficial uses of both surface water and groundwater. Long-term goals include design and implementation of BMPs for surface water and groundwater.	Potential TBC.
Federal Clean Air Act (42 U.S.C. 7401 et seq.)	Requires minimization of the harmful effects to air quality from excavation, construction, and other removal activities.	Potentially applicable or relevant and appropriate.
Idaho Air Pollution Control Rules (IDAPA 58.01.01)	Requires that remedial activities be designed to take all reasonable precautions to prevent particulate matter from becoming airborne, including the use of water or chemicals as dust suppressants, the covering of trucks, and the prompt removal and handling of excavated materials.	Potentially applicable.
Idaho Asbestos Statute	Any asbestos-containing materials encountered in mill demolition must be removed and disposed of in accordance with these regulations.	Potentially applicable
Idaho Land Remediation Rules (IDAPA 58.01.18.027)	Institutional controls may be used in instances where residual concentrations of chemicals exceed risk-based health standards, or when they are required to assure the continued protection of human health and the environment or the integrity of the cleanup action.	Potentially applicable.
Federal Hazardous Materials Regulations (49 CFR Parts 171 to 180)	The movement of hazardous materials on public roadways must follow the placarding, packaging, documentation, and other requirements of this U.S. Department of Transportation regulation. Regulation also establishes emergency response/reporting procedures.	Potentially applicable.
Idaho Property Condition Disclosure Act (Idaho Statute 55-2506)	Idaho Statute 55-2506 requires the disclosure by sellers of residential real property of the known presence of hazardous materials or substances.	Potential TBC for institutional control activities that involve the publication/ distribution of environmental data.
Washington Clean Water Act (Ch. 90.48 RCW; Ch. 173-216, 220)	Discharges from a point source to waters of the state must meet surface water quality standards.	Potentially applicable.
Washington State Board of Health (Ch. 43.20 RCW; Ch. 246-290 WAC)	Protects public drinking water supplies and establishes maximum contaminant levels for drinking water.	Potentially relevant and appropriate
Washington Hazardous Waste Management Act (Ch. 70.105 RCW) and dangerous waste regulations (Ch. 173-303 WAC)	Provides requirements for the identification, accumulation, transport, treatment, and disposal of dangerous (including federally hazardous) wastes.	Potentially relevant and appropriate

Table 7.3-9 (Continued)
Potential Action-Specific ARARs and TBCs

Citation	Summary of Requirement	Evaluation
Washington Solid Waste Management Act (Ch. 70.95 RCW); and minimum functional standards for solid waste handling (Ch. 173-304 WAC) and criteria for municipal solid waste landfills (Ch. 173-351 WAC)	Sets forth standards for siting and design of solid waste landfills. Specific standards may be ARARs for disposal of contaminated soil and sediments.	Minimum functional standards potentially applicable; municipal solid waste landfill regulations potentially relevant and appropriate
Washington Clean Air Act (Ch. 70.94 RCW; Ch. 173-400, 460 WAC)	Discharges from treatment units must meet acceptable source impact levels (ASILs) at the property boundary. Generation of fugitive emissions is also regulated.	Potentially relevant and appropriate.
Washington Water Well Construction Act (Ch. 18.104 RCW; Ch. 173-160 WAC)	Should monitoring wells need to be constructed to assess groundwater quality, these technical standards would be potential ARARs	Potentially applicable
Idaho Evidence Public Writings Records Exempt From Disclosure - Personnel Records, Personal Information, Health Records, Professional Discipline [Idaho Statute 9-340C(6)]	Records of a personal nature related directly or indirectly to the application for and provision of statutory services rendered to persons applying for participation in an environmental or a public health study are exempt from disclosure [Idaho Statute 9-340C(6)]. To the extent required by the Federal Clean Air Act and RCRA for state primacy over any delegated or authorized programs, even if the record is otherwise exempt from disclosure under section 9-340 Idaho Code, any person may inspect and copy any other record unless the record is a trade secret [Idaho Statute 9-342A(1)(d)].	Potential TBC for institutional control activities that involve the publication/ distribution of environmental data.

[a] Tribal ARARs and TBCs apply only on reservation lands.

Notes:
ARAR - applicable or relevant and appropriate requirement
BMPs - best management practices
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
CFR - Code of Federal Regulations
EPA - U.S. Environmental Protection Agency
FR - Federal Register
IDAPA - Idaho Department of Administration and Administrative Rules
IDHW - Idaho Department of Health and Welfare
LDR - Land Disposal Restriction
NPDES - National Pollutant Discharge Elimination System
RCRA - Resource Conservation and Recovery Act
TBC - to be considered

8.0 DESCRIPTION OF ALTERNATIVES

In the FS, alternatives were developed for a comprehensive, basin wide remedy. However, due to costs and complexity, it is likely that the preferred comprehensive remedy would be implemented in phases. Phasing implementation causes difficulty in determining what subparts to prioritize first, especially as concerns ecological risks. To simplify the alternatives evaluation process and ensure that the alternatives meet threshold criteria for the Basin (i.e., Alternatives 2 through 4), the alternatives evaluation is performed Basin wide. However, each alternative actually consists of more than 1,100 individual source decisions as to what specific remedial technology would best apply. Generally, source areas can be classified into the following categories:

- CSM Units 1 and 2 - Upper Basin
  - Adits
  - Tailings-impacted floodplain sediments in the current and historic 100-year floodplain
  - Unimpounded tailings piles
  - Impounded tailings piles at inactive facilities
  - Impounded tailings piles at active facilities
  - Waste rock piles in 100-year floodplains
  - Waste rock piles outside 100-year floodplains

- CSM Unit 3 – Lower Basin
  - Riverbed sediments
  - Banks and levees
  - Wetland sediments
  - Lake sediments
  - Other 100-year floodplain sediments
  - Cataldo/Mission Flats dredge spoils

- CSM Unit 4 – Lake Coeur d'Alene
  - Lakebed sediments

- CSM Unit 5 – Spokane River
  - Sediments

Because of the complexities associated with developing comprehensive remedial alternatives for the site, including inherent differences between human health and ecological exposure pathways, two concurrent efforts were used. These efforts have resulted in two complementary sets of remedial alternatives:

- **Alternatives to protect human health**—Human health alternatives for the Coeur d'Alene River Basin were developed for four environmental media: soil (five alternatives), drinking water (six alternatives), house dust (three alternatives), and fish consumption (3 alternatives). The human health alternatives for each medium were assembled independently of the other media to allow maximum flexibility in future decision making, including integration with the ecological alternatives, as developed in the second effort.

- **Alternatives to protect the environment**—Selected ecological alternatives may also have a beneficial impact on human health in addition to the environment. However, the emphasis here is on the environmental or ecological component. Reflecting a comprehensive approach, the ecological alternatives were assembled to deal with both "local" site-specific effects and "global" site-wide effects. Six alternatives were developed for the Coeur d'Alene River Basin, two alternatives were developed for Coeur d'Alene Lake, and five alternatives were developed for selected sites in Washington along the upper Spokane River.

The alternative development process for both human health and ecological protection included identification of all potentially applicable technologies and process options; screening of technologies and process options on the basis of technical implementability only; and evaluation and screening of retained technologies and process options based on effectiveness, implementability, and cost. The retained process options were then assembled into alternatives that cover a range of remedial options, including "no action," as required by the NCP.

The remedial alternatives are not mutually exclusive choices and do not limit the choice of a remedy. The preferred alternative can combine elements of the various alternatives, refine or modify those elements, or add to them. The remedial alternatives have been developed to a planning level of detail, not a design level of detail. Any remedial actions would require a site-specific remedial design.

Cleanup plans for the basin have also been developed by the State of Idaho (State of Idaho Cleanup Plan) and the mining companies (Mining Companies Cleanup Plan). Because the ecological components of these plans enhance the range of remedial options available to decision makers, these plans are presented as ecological Alternatives 5 (State plan) and 6 (mining companies plan), based on interpretation of available documentation. The human health alternatives include the human health components of these plans, with minor exceptions, and the State plan and mining companies plan are not presented as distinct alternatives.

8.1 HUMAN HEALTH ALTERNATIVES

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

- Soil

- Drinking water
- House dust
- Fish consumption

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

8.1.1 Soil Alternatives

Soil Alternative S1—No Action

This alternative would leave contaminated soil in place with no change in existing conditions. It would not remove contaminated soil from residential yards and gardens in the basin, it would provide no information, education, or counseling for residents with contaminated yards, and it would not monitor blood lead levels to evaluate the impacts of continued exposure. The no action alternative provides a baseline from which to compare the action alternatives.

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. Services also include biological monitoring, yard and home sampling, and nursing follow-up services. An institutional controls program which would include local construction regulations (developed and implemented in conjunction with local zoning, building, or planning commissions) may also be considered in certain areas if risk conditions warrant.

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 at 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. Where appropriate, exteriors of structures would be

pressure-washed before remedial measures are performed, to reduce the potential for recontamination from lead-based paint. Risk would be further reduced by installing visual markers to delineate the limits of soil removal. In addition to residential yards, common use areas such as streets, alleys, rights-of-ways, and playgrounds would also be candidates for remediation if soil contamination and exposure risks warrant. This alternative would also include revegetation and interim dust control during soil excavation. 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, 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 and dispose of soil that exceeds action levels. 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. If warranted, exteriors of structures would be pressure-washed to reduce the potential for recontamination from lead-based paint. This alternative would include backfilling the properties with clean soil to reestablish site grades and revegetating the reclaimed ground surface. It would also include interim dust control during soil excavation. This alternative is not envisioned for recreational areas.

8.1.2 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. It would take no action to prevent exposure to COPCs in drinking water, and would provide no information or education to exposed residents. The no action alternative provides a baseline from which to compare the action alternatives.

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. Because this alternative would require an ongoing effort, it is considered primarily for use at the community level and is generally not considered feasible for individual residences, except for raising general awareness of risks.

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. Filters would be placed at each tap or other point of use in residences. If possible, a single filter would be placed on the main residence service line to

avoid potential confusion and change-out costs for multiple filters. A change-out program would be required to ensure that filters are changed on the required schedule.

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. Information programs would be used to better inform residents about lead risks from in-home plumbing.

Drinking Water Alternative W5—Public Information and Alternative Source, Groundwater

For properties currently supplied by contaminated water 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. The suitability of the alternative aquifer (for example, water yield and quality) would need to be evaluated before drilling any new wells. After well construction, groundwater sampling would be conducted to verify that new wells supply water capable of achieving the RAOs. Subsequent monitoring would also be conducted to ensure continual achievement of RAOs. Information programs would be used to better inform residents about lead risks from in-home plumbing.

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 individual residences or common areas with a hookup to the existing public conveyance system. For areas outside water districts (mostly in the tributary gulches), it is assumed that public water utilities will 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. Alternative W6 would include a survey of residences during remedial design to determine whether they were served by public water utilities, and to determine residences at which COPCs in drinking water exceed maximum contaminant levels.

8.1.3 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. It would take no action to prevent exposure, and provide no information or education to exposed residents. The no action alternative provides a baseline from which to compare the action alternatives.

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 PHD's Lead Health Intervention Program at the BHSS 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. Monitoring would also be conducted to ensure continued achievement of RAOs.

House Dust Alternative D3—Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Contingency 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 which provide a source for recontamination. Interior cleaning would include a one-time cleaning of hard surfaces and heating and cooling systems and removal and replacement of major interior dust sources such as carpet and some soft furniture. These activities would occur only after exterior sources of contamination had been permanently remediated, to ensure cost-effectiveness and prevent recontamination. Based on observations from yard remediation in the BHSS, once exterior yard soil is cleaned up, relatively few homes (a maximum of 20 percent of the homes that required yard cleanup, or about 100 to 200 homes) are expected to require the additional interior cleaning provided by Alternative D3. In addition, this alternative would consider crawl spaces, attics, and basements. Contaminated crawl spaces would be capped with a sand or synthetic cover to prevent generation of dust and tracking of soil into the home. Accessible attics and basements would also be cleaned. The exact scope of this alternative will depend on the conditions of each residence. Temporary relocation of residents might be required during cleaning to protect their safety. Monitoring would also be conducted to ensure that RAOs continue to be achieved after the remedy is implemented.

8.1.4 Fish Consumption Alternatives

Fish Consumption 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. It would take no action to prevent exposure and provide no information or education to people likely to consume contaminated fish. The no action alternative provides a baseline from which to compare the action alternatives.

Fish Consumption 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 of the potential health risk of consuming contaminated fish caught in waterways and wetlands. All printed materials, press releases, and public meetings developed to inform the public of basin metals issues would include information about the fish risks, how to reduce exposure, prevention, and other pertinent issues. Fish hazard information programs would be expanded to the Coeur d'Alene Indian Reservation communities, as appropriate, to ensure that Tribal members are kept informed. Targeted community education programs would be implemented in Benewah, Kootenai, and Shoshone Counties. A well-maintained signage program to educate fishermen and other water users of metals hazards would be implemented at all river/lake access sites and common use areas, including the Coeur d'Alene River Trail system corridor. Idaho Department of Fish and Game, Idaho State Parks, USFS, and BLM field personnel who regularly contact basin fishermen and recreational users would be trained in metals risk management and supplied with appropriate pamphlets and signs.

Fish Consumption Alternative F3—Information and Intervention and Monitoring

This alternative would build on the efforts of informing and educating fishermen of risks 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 trained seasonal "river ranger" program 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.

8.2 ECOLOGICAL ALTERNATIVES

A range of comprehensive alternatives, designed to achieve compliance with regulations and long-term protection of the environment to the extent possible, were developed in the FS. In comparison to human health, the FS showed that the long-term goals, such as surface water quality standards and compliance with soil/sediment PRGs, will be difficult to achieve throughout the Basin given the extent of contamination.

While the alternatives described in this section are comprehensive in nature, it is recognized that an incremental approach would likely be used to implement an ecological remedy, due to both cost and complexity. A number of benefits could be realized by using a phased implementation approach.

- Cost, environmental, and socio-economic impacts would be moderated.
- Observable results could be achieved within a relatively short time in the areas addressed in the initial phase.
- The results of remedy implementation could be monitored to improve the effectiveness of subsequent remedial activities.
- Opportunities would exist for innovative, cost-effective technologies to evolve over time.

The general response actions for the ecological FS are shown in Table 8.2-1. These are further divided into process options, which are depicted in Table 8.2-2. The application of a specific process option is dependent upon source specific circumstances.

Figures 8.2-1 through 8.2-15 provide illustrations of selected typical conceptual designs (TCDs). Table 8.2-3 describes the purposes and application criteria for the selected TCDs.

8.2.1 Upper and Lower Basin

Six ecological alternatives have been developed for the Upper and Lower Basin.

- 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

Remedial actions were identified for various contamination sources under each of the alternatives. Table 8.2-4 describes the generalized approach each alternative takes to remediating source types. However, to better describe how this is applied at the watershed and source level, Tables 8.2-5, 8.2-6, and 8.2-7 show the proposed remedial actions by source and waste type for a typical area, i.e., Ninemile Creek.

Estimated unit costs for each of the TCD groups are presented in Tables 8.2-8 and 8.2-9. Alternative 5 and 6 TCDs and estimated unit costs are listed in Tables 8.2-10 and 8.2-11, respectively. Alternatives 5 and 6 were developed by the State and mining companies, respectively. The TCDs associated with these alternatives vary in design details from the TCDs used to develop Alternatives 2, 3, and 4. As a result, the unit costs are different. The unit costs for Alternatives 2, 3, and 4 are also presented for the example Ninemile Creek remediation shown in Tables 8.2-5 through 8.2-7.

For the purpose of comparing the effectiveness of the six alternatives, estimates were made of the reduction in zinc concentrations at completion of remedy implementation and the time needed to attain the AWQC for zinc, including natural recovery (URSG 2001). The estimates were made for the South Fork at Pinehurst, and assume that AWQC are achieved for sources within the BHSS. The results are shown in Table 8.2-12. Alternative 4 is estimated to result in the lowest zinc concentration following remedy implementation and the shortest time to achieve ARARs. Alternative 3 is predicted to result in about a 40 percent higher zinc concentration and about a 50 percent longer time to achieve zinc AWQC compared to Alternative 4. Alternative 2 is predicted to result in about a 190 percent higher zinc concentration and about a 140 percent longer time to achieve zinc AWQC compared to Alternative 4. Alternatives 5, 6, and 1 result in increasingly higher zinc concentrations and longer times to achieve zinc AWQC.

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 and metal transport via erosion and leachate loading to groundwater and surface water. Bioengineering would be used to provide bank and stream stabilization, control erosion of contaminated sediments, and support natural recovery of riverine and riparian habitat. Chemical 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). Residual risks would be associated with contaminated media left in place or only partially contained.

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:

- Regional repositories in the Upper Basin
- A regional active water treatment plant
- More extensive use of hydraulic isolation, including inaccessible current and historic 100-year floodplain sediments and additional tailings impoundments in the Upper Basin

Disposal of materials removed from the Lower Basin (including river banks, levees, and beds; wetlands; and lateral lakes) would be at a regional repository or by confined aquatic disposal (CAD).

Alternative 4—Maximum Removal, Disposal, and Treatment

Alternative 4 would include removal of sources to the maximum practical extent with disposal in regional repositories. It would extend the use of active water treatment, and inaccessible current

and historic 100-year floodplain sediments 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 practicable.

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 repositories and passive water treatment, but does not include an active water treatment plant. In developing the alternative, IDEQ sought to achieve a balance between benefit, cost, and impact to the environment in both the long term and short term.

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 repositories and active water treatment plants are not included.

8.2.2 Coeur d'Alene Lake

Based on currently available information, as described in Section 6.3, there does not appear to be adequate technical justification for active remediation (e.g., dredging, capping) of lakebed sediments. Two alternatives were developed for Coeur d'Alene Lake.

- Alternative 1—No Action
- Alternative 2—Institutional Controls

Alternative 1—No Action

The no action alternative is developed here to provide a basis for comparing existing and future environmental impacts that would be present if no remedy is implemented in Coeur d' Alene Lake. Alternative 1 would include monitoring.

Alternative 2—Institutional Controls

This alternatives includes institutional controls such as signage, monitoring and implementation of the Lake Management Plan (Coeur d'Alene Tribe et al. 1996). The latter is summarized in the following paragraphs.

A lake management study was initiated in 1991. One of the objectives of this study was to develop a lake management plan that would identify actions needed to achieve water quality goals. It was not deemed appropriate to apply a single water management strategy to the entire lake, therefore, the lake was divided into the following four water quality management zones:

- **Nearshore** (water depths less than 20 feet)
- **Shallow, southern lake** (south of the mouth of the Coeur d'Alene River and including the shallow lakes such as Benewah, Chatcolet, Hidden, and Round)
- **Lower rivers** (lower reaches of the St. Joe and Coeur d'Alene Rivers that are affected by backwater from the lake)
- **Deep, open water** (north of the mouth of the Coeur d'Alene River)

Management goals for the nearshore zone primarily involve implementation of best management practices to control erosion from watersheds that feed the lake. Residential and municipal sewer systems will also be addressed to reduce nutrient loadings entering the lake from these sources.

In the shallow, southern lake, best management practices would also be employed to reduce sediments entering the lake through erosion from littoral areas of the lake, riverbanks, and watersheds. Where necessary, municipal water treatment plants would be upgraded to reduce nutrient contributions to the lake. Establishment of "no wake" zones was suggested in the Lake Management Plan for erosional stream banks.

The principal focus of the Lake Management in the Lower River is to reduce riverbank erosion. This would be accomplished through bank stabilization.

In the deep, open water zone, management practices to improve water and sediment quality would primarily be those employed in the other three zones. Deep waters in the lake would be a beneficiary of actions taken to reduce erosion and nutrient loading from within the basin.

8.2.3 Spokane River

Five alternatives have been developed for the Spokane River. Alternatives for the Spokane River address both human health and ecological protection and were developed based on specific input from State of Washington.

- 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 State and the Mining Companies did not develop cleanup plans for the 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.

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.

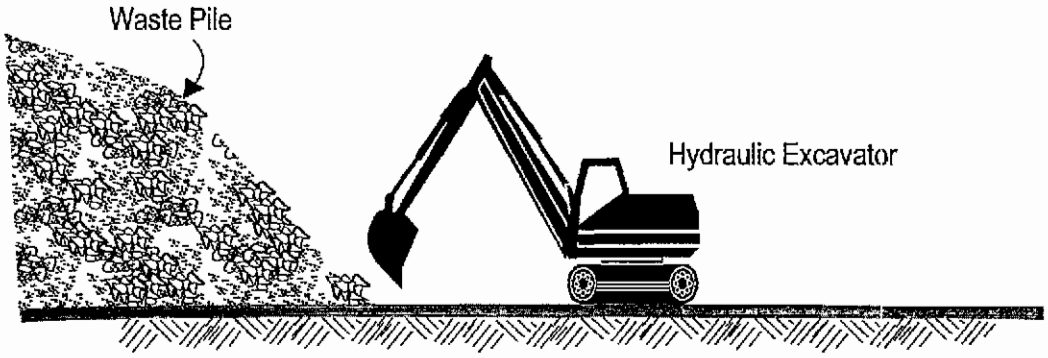
Alternative 4—More Extensive Removal, Disposal, and Containment

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 habitat areas that may pose significant ecological risks. The affected beach and bank materials would be excavated and disposed of off-site, permanently eliminating the human health and ecological exposure pathways of concern. All excavated areas would be backfilled with suitable material, to restore desired grades and elevations. In-stream sediments (behind Upriver Dam) exceeding PRGs would be capped to minimize direct ecological exposures.

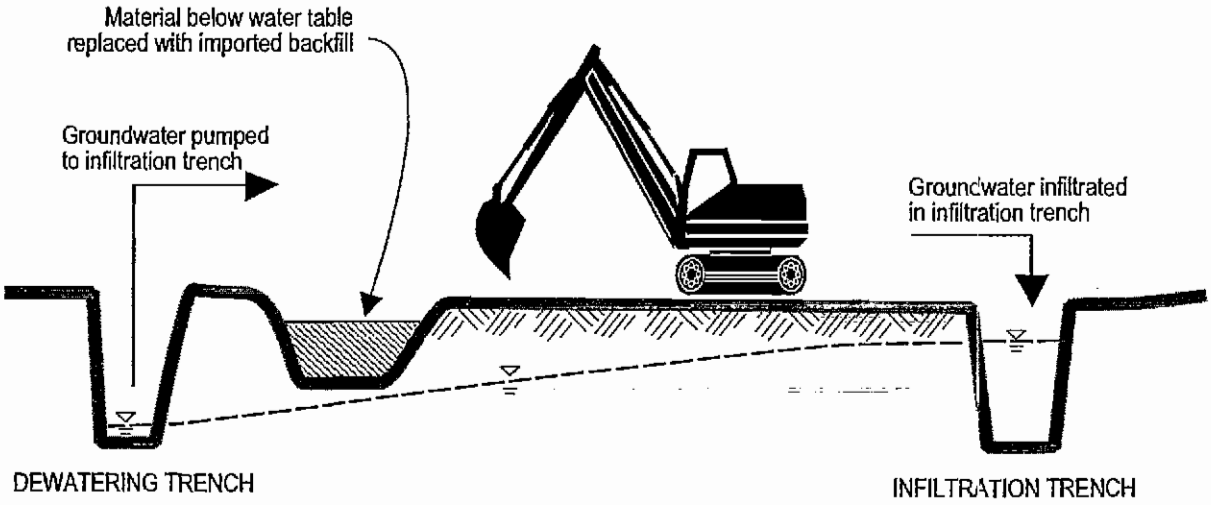
Alternative 5—Maximum Removal and Disposal

Alternative 5 includes more extensive beach and in-stream sediment cleanup actions to remove, where practicable, all materials posing significant human health or ecological risks. The affected beach and bank materials would be excavated and disposed of off-site, permanently eliminating the human health and ecological exposure pathways of concern. All excavated areas would be backfilled with suitable material, to restore desired grades and elevations. In-stream sediments behind Upriver Dam that exceed PRGs would be dredged and disposed of off-site, eliminating the ecological exposures of concern.

TCD C1. Excavation above water table



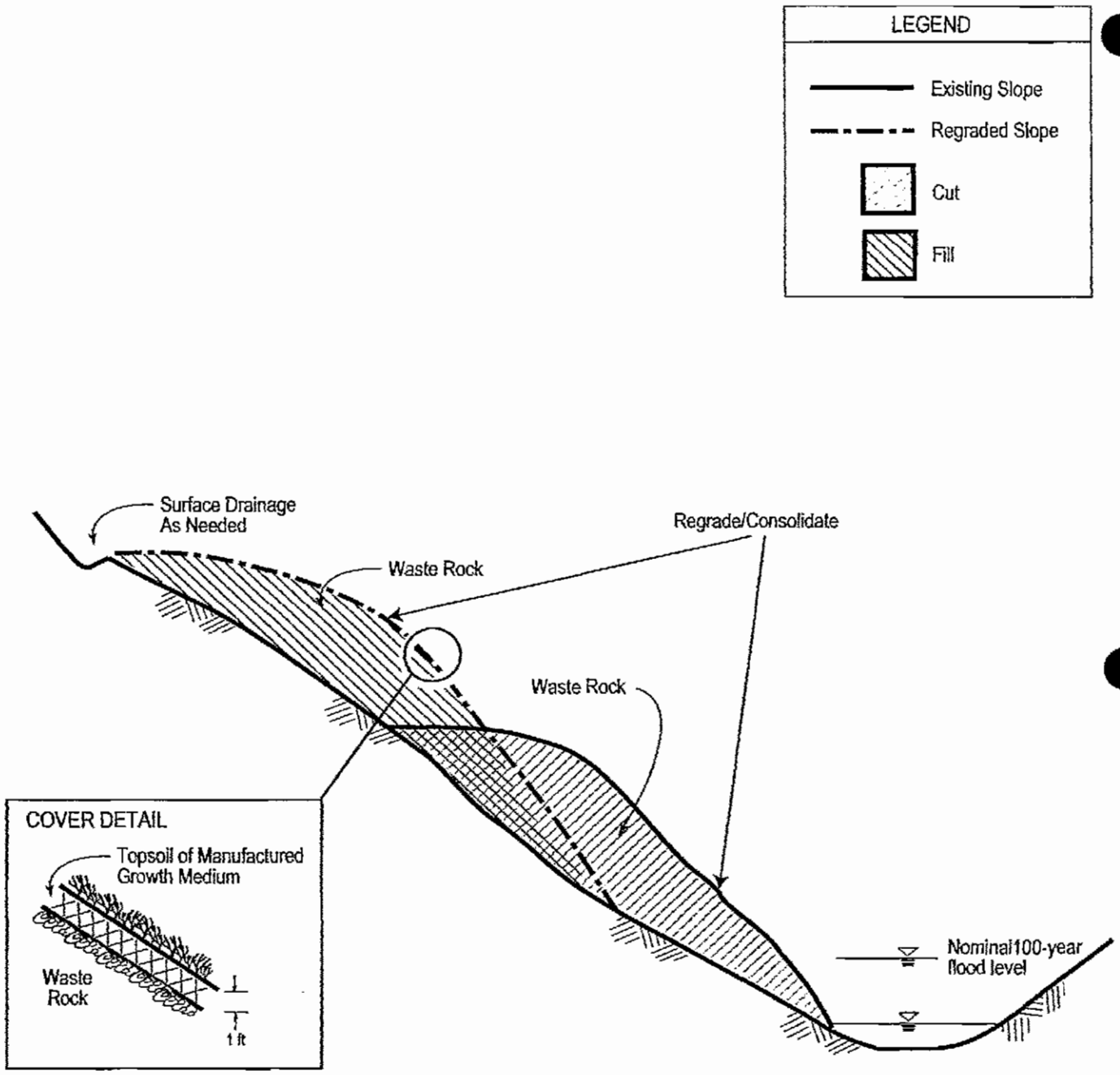
TCD C1a. Excavation below water table



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

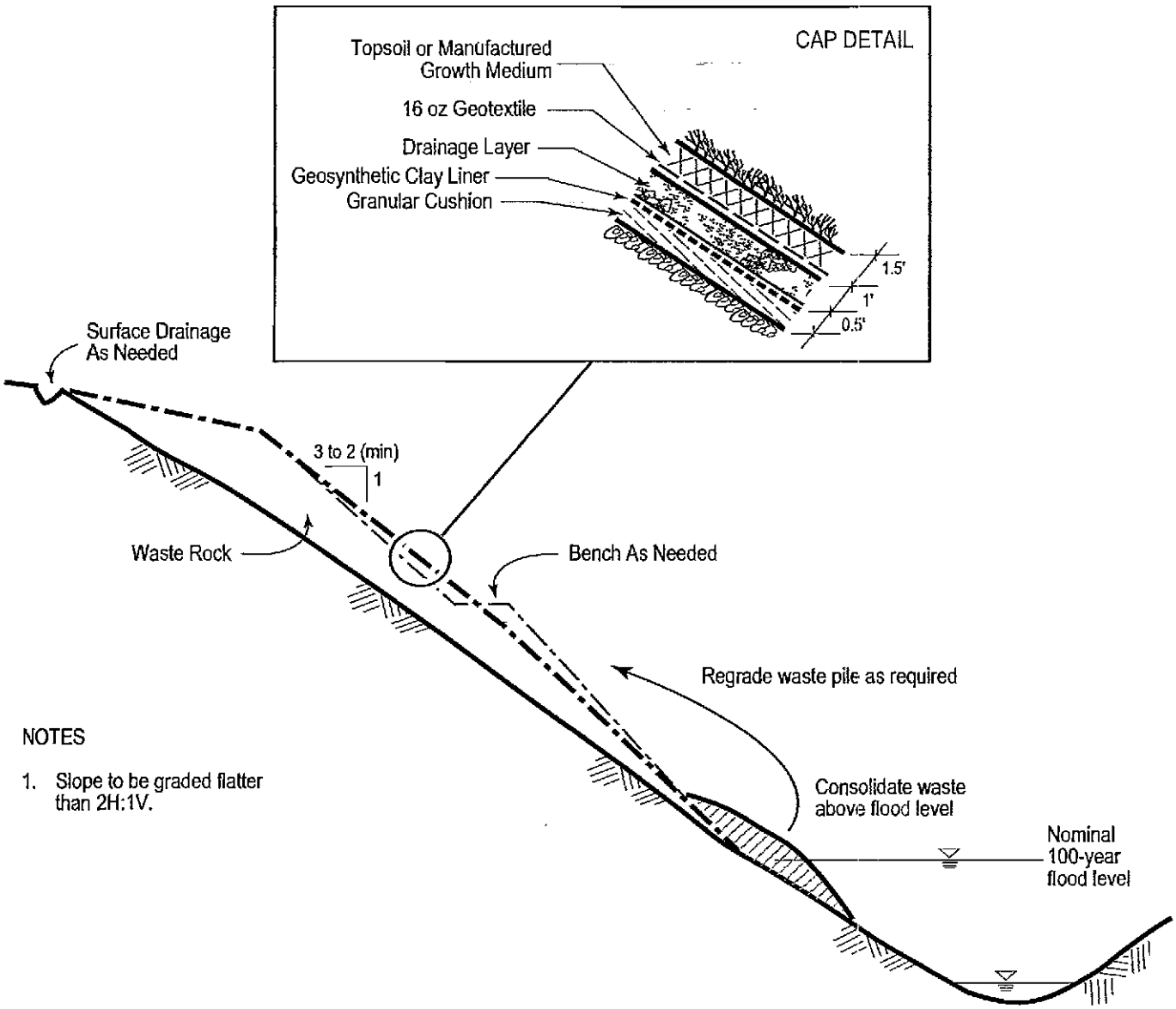
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-2001 091500	*Figure 8.2-1* **TCD C1: Excavation**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-102 111000	**Figure 8.2-2** **TCD C2: Regrade/Consolidate/Revegetate**



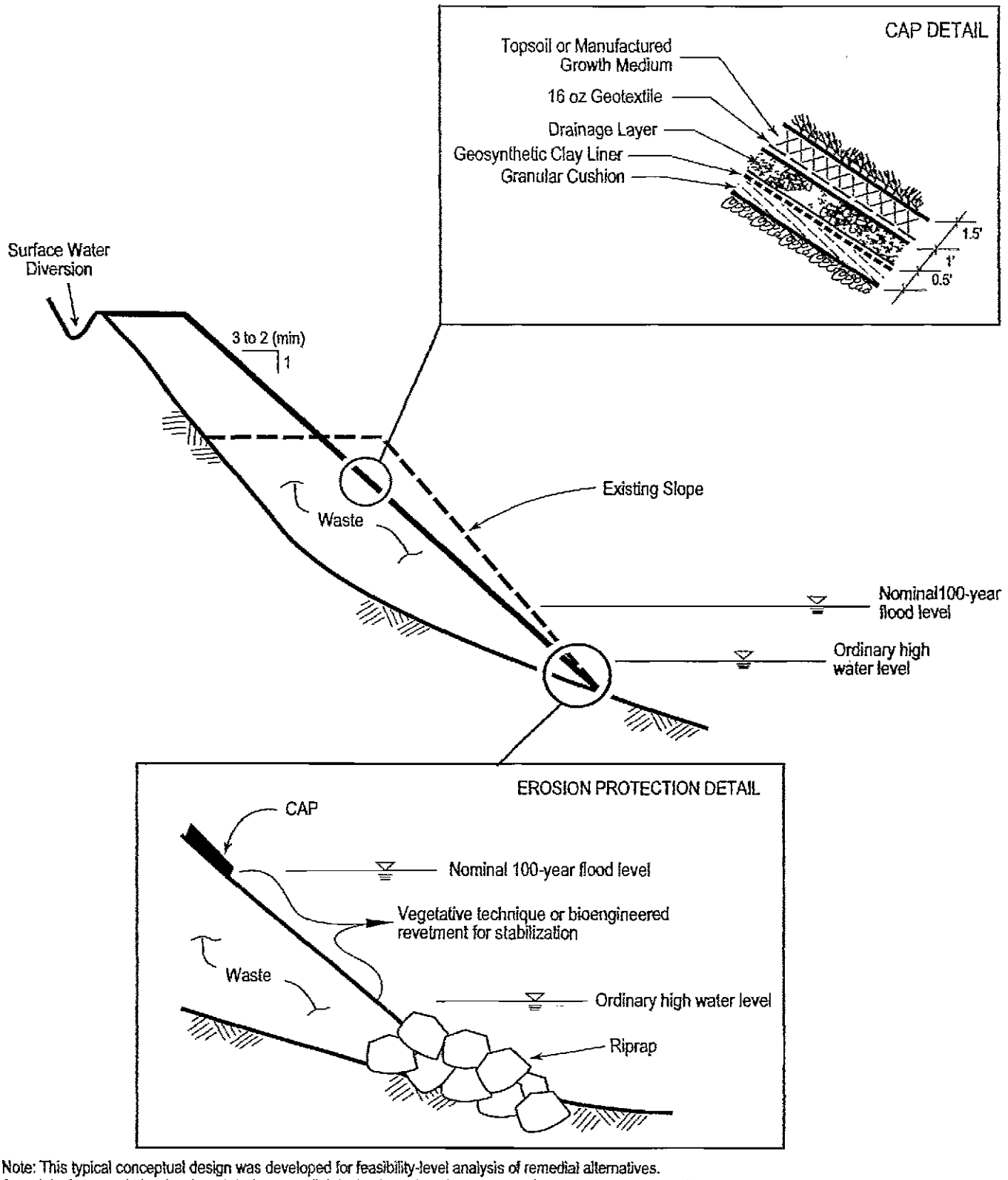
NOTES

1. Slope to be graded flatter than 2H:1V.

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

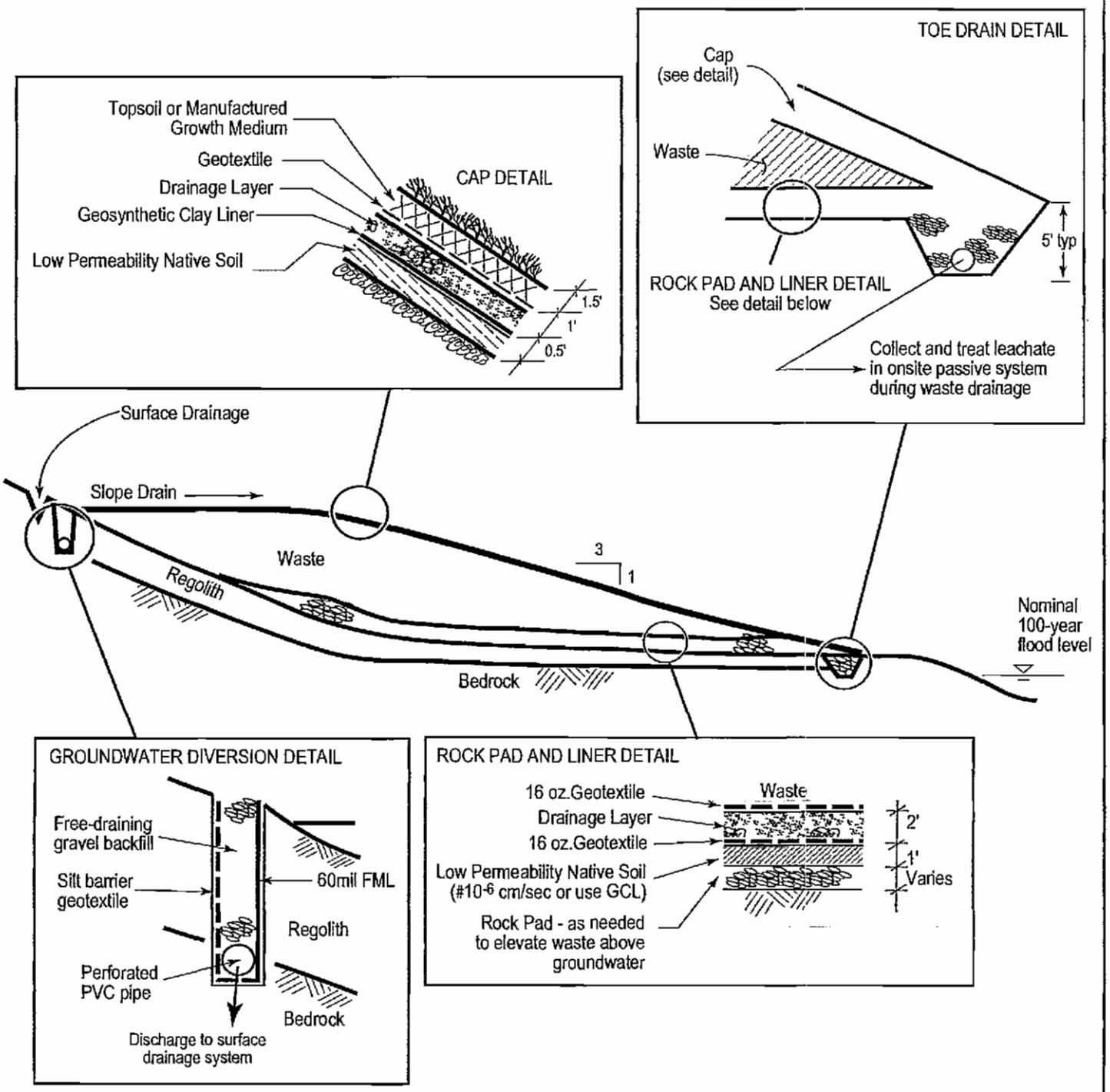
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-103 030700	**Figure 8.2-3** **TCD C3: Low Permeability Native Soil Cap**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

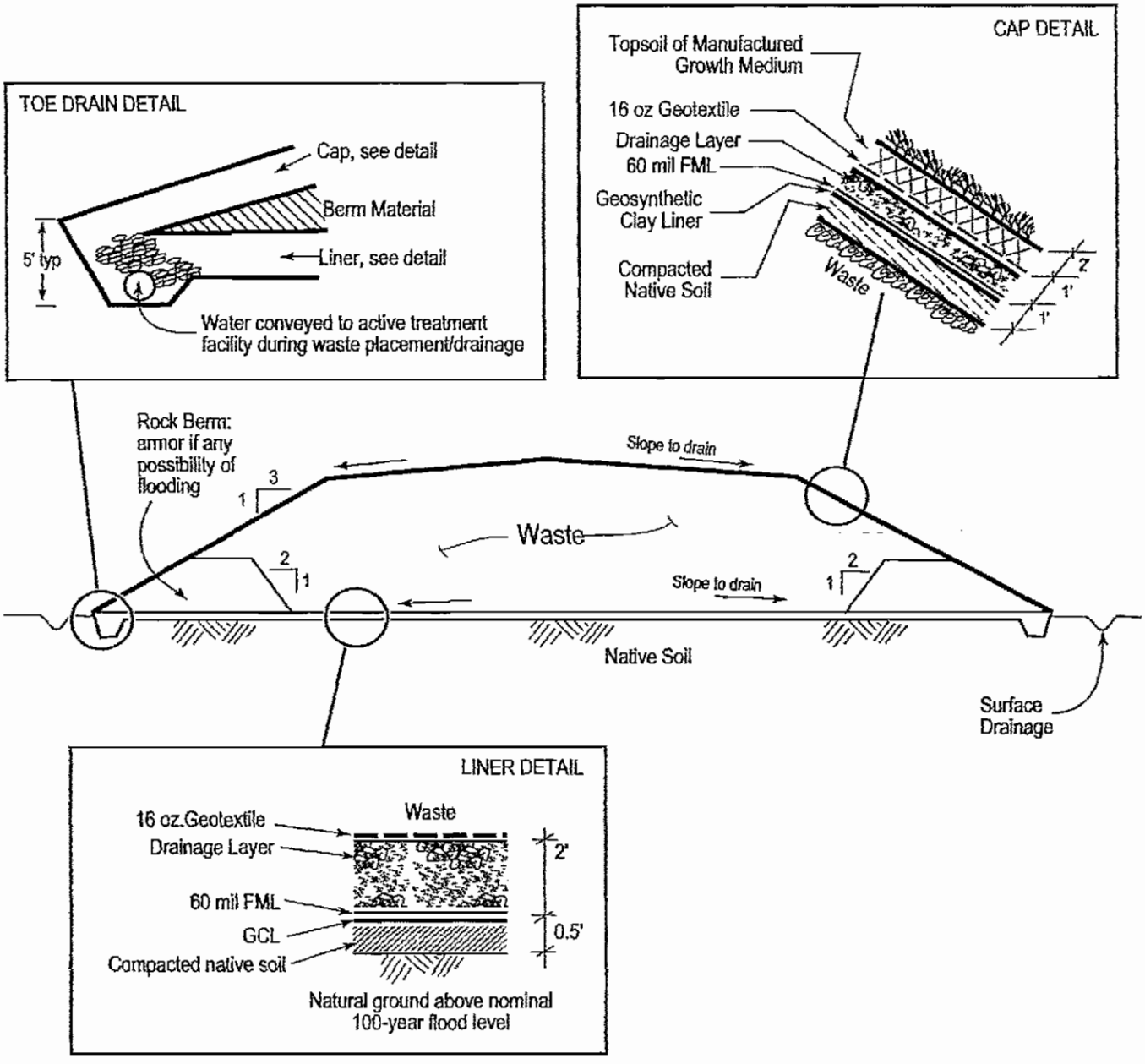
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-105 11100	**Figure 8.2-4** **TCD C5: Low Permeability Native Soil Cap with Erosion Protection**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

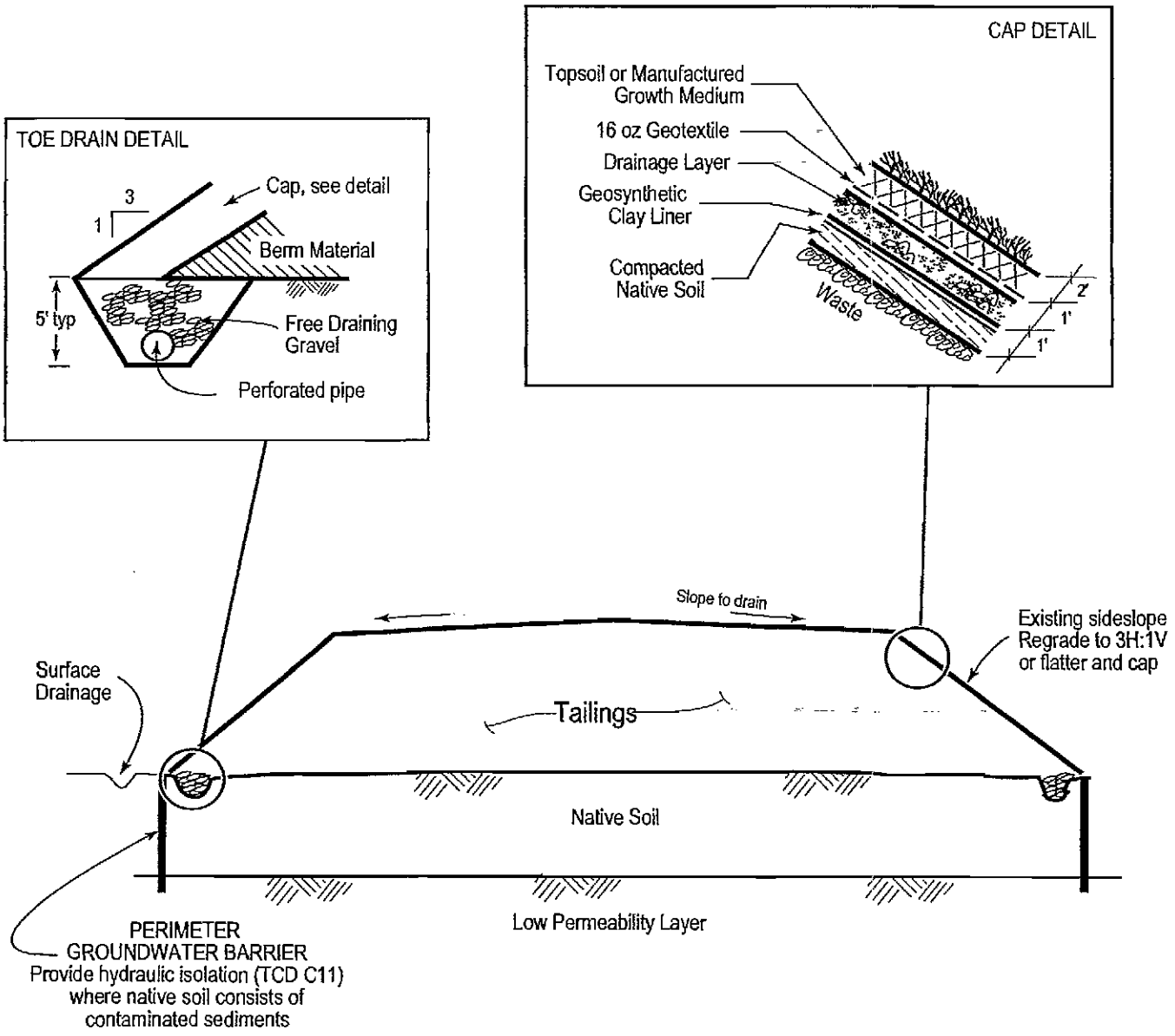
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-107 111100	**Figure 8.2-5** **TCD C7: Local Repository Above Flood Level**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

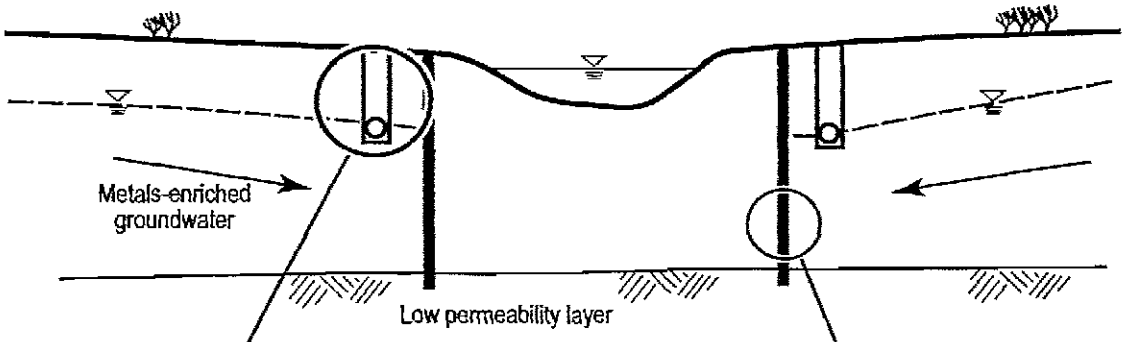
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control. 4162500.06664.05a Generation: 1 FS-101 111100	**Figure 8.2-6** **TCD C8: Regional Repository**

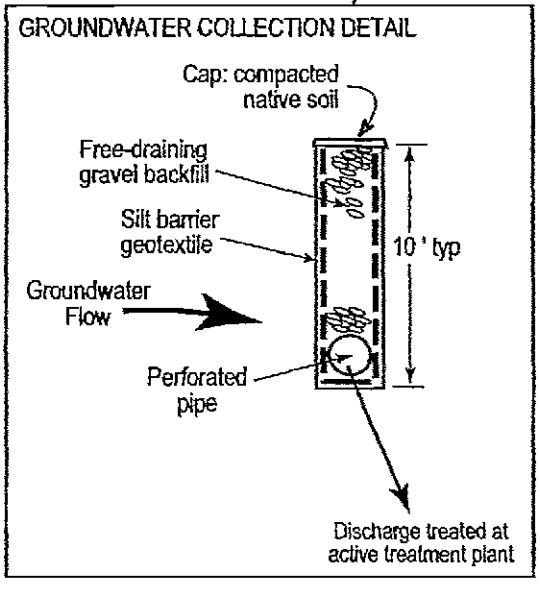


Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-108 111100	**Figure 8.2-7** **TCD C9: Tailings Impoundment Closure**





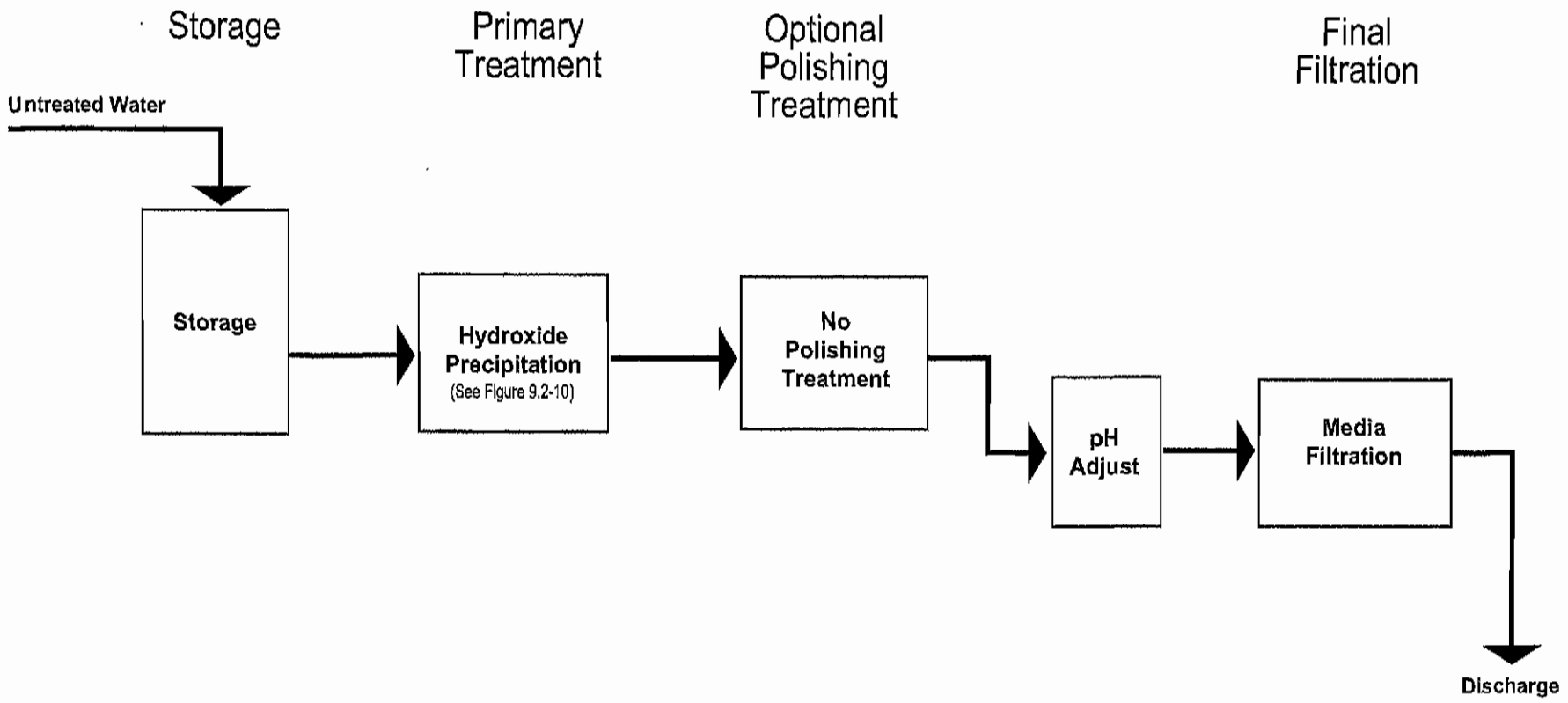
GROUNDWATER BARRIER
Slurry wall placed minimum 1 foot into low permeability layer

Note:
1. Unit cost based on slurry wall on one side of stream
2. Also used for isolation of discrete facilities (e.g. tailings impoundments) using wall around entire perimeter of facility

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

NO SCALE

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-110 11100	**Figure 8.2-8** **TCD C11: Hydraulic Isolation Using Slurry Wall**



Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

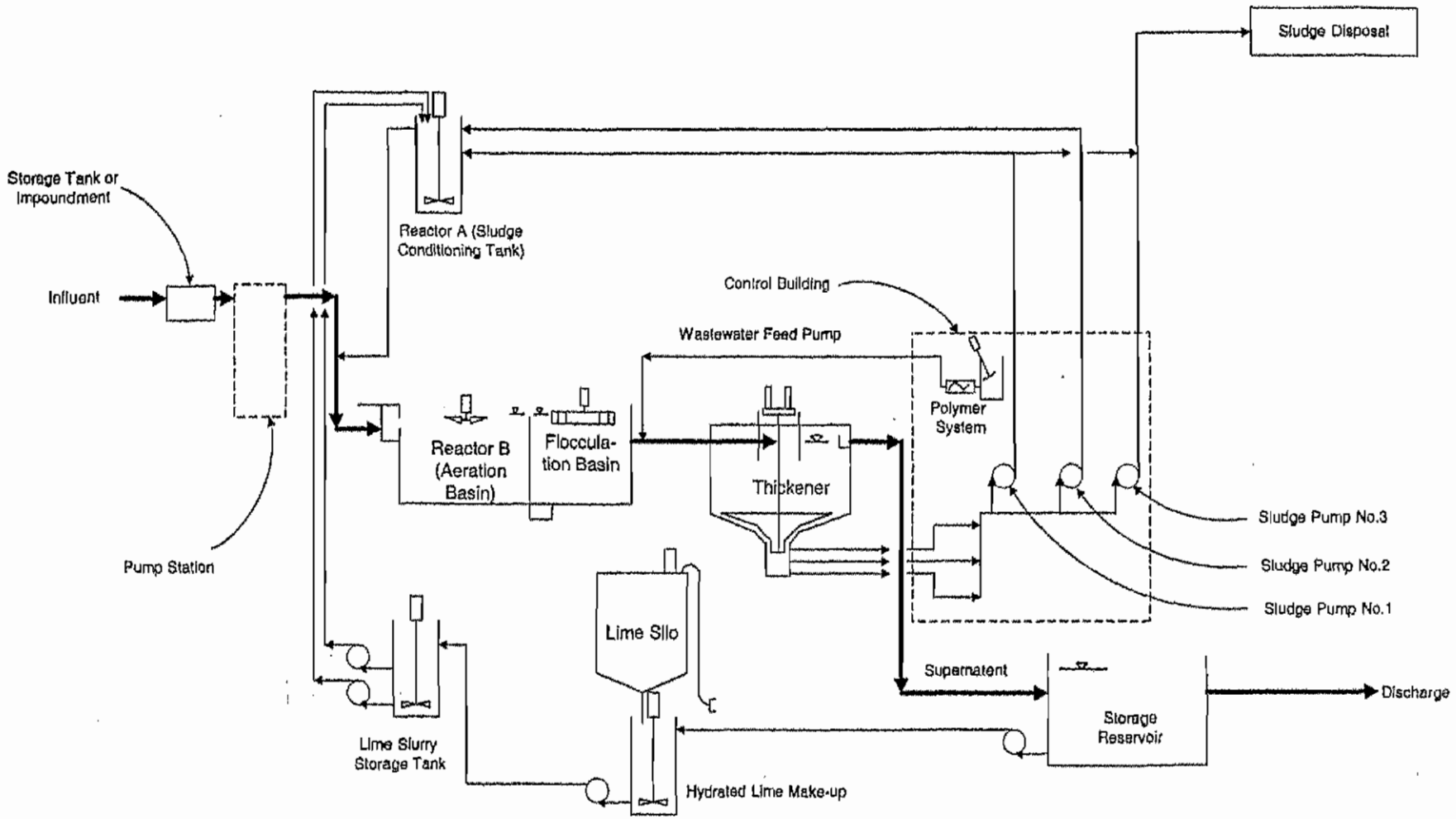
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
REMEDY REVIEW BOARD

Doc. Control: 4152500.06664.05a
Generation: 1

TM3-101a
091500

Figure 8.2-9
Flow Diagram:TRMT-1



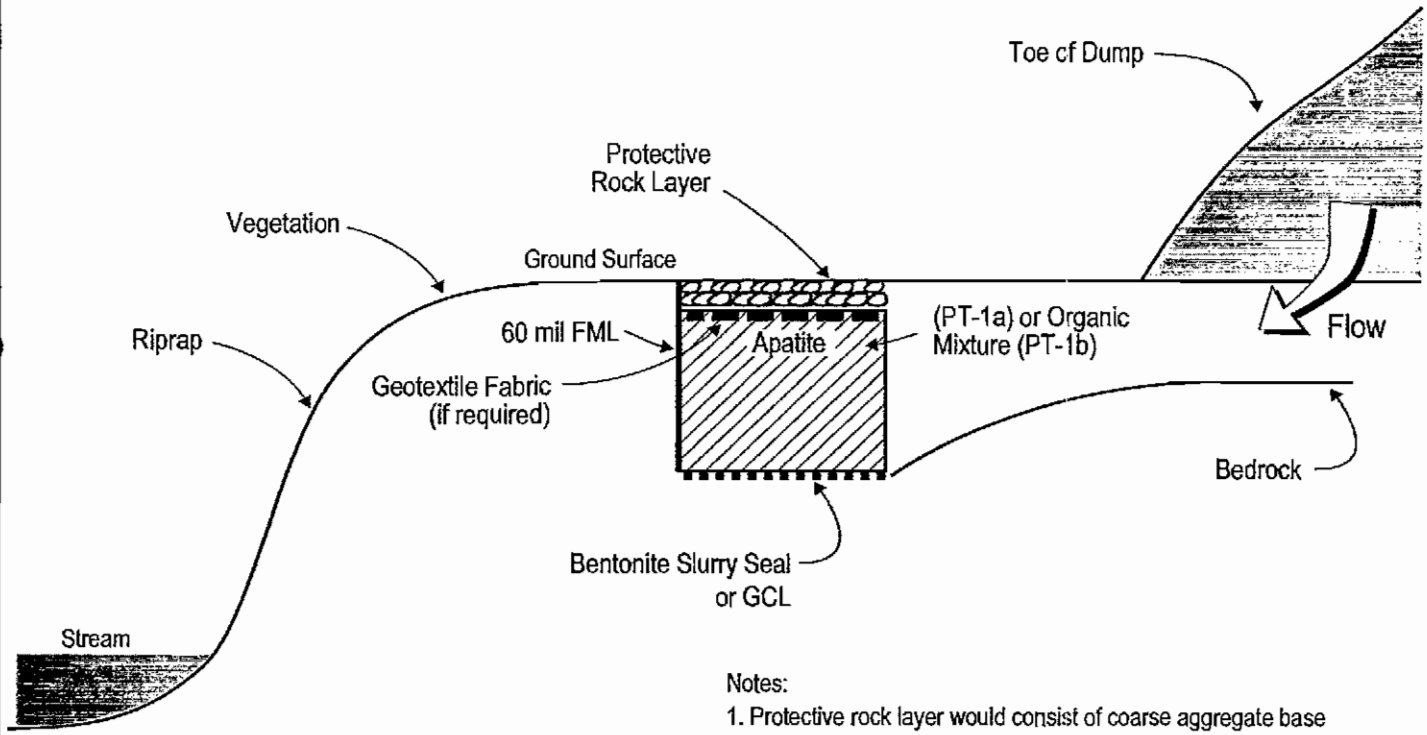
EPA REGION 10

027-RI-CO-102Q
Coeur d'Alene Basin RI/FS
EDY REVIEW BOARD

Doc. Control:
Generation: 1

TM3-102
030800

Figure 8.2-10
HDS Hydroxide Precipitation

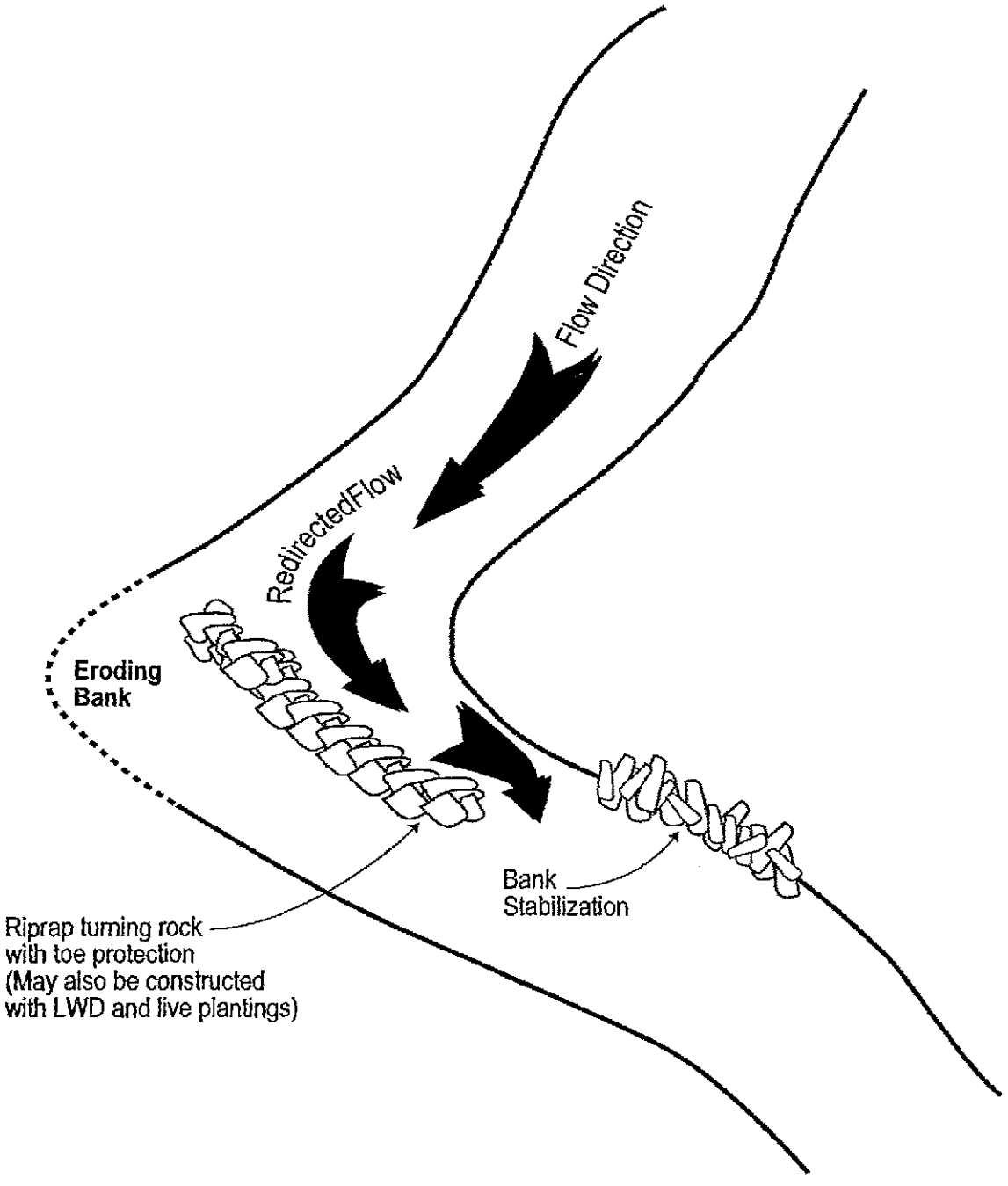


Notes:

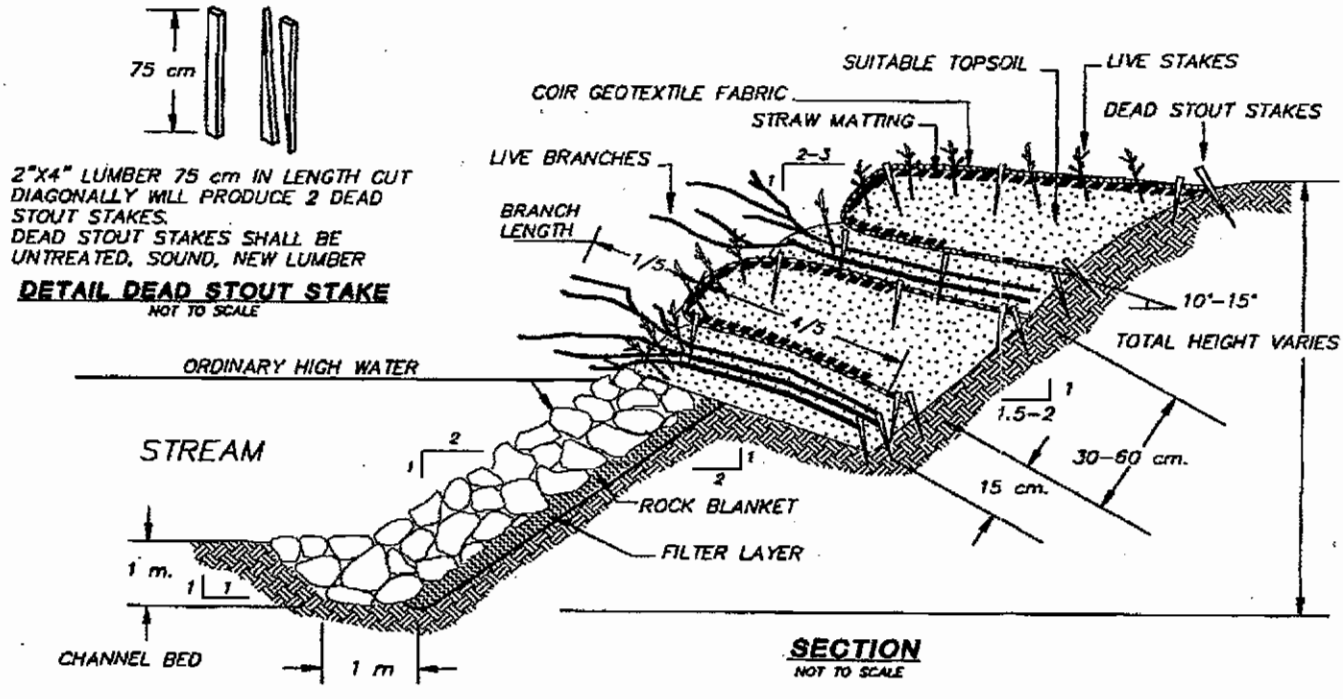
1. Protective rock layer would consist of coarse aggregate base (Type A5-2" Minus).
2. Baffles will typically extend from bottom to 1/2 to 2/3 height of apatite.
3. FML = Flexible membrane liner
4. GCL = Geosynthetic clay liner

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.05664.05a Generation: 1 FS-103 111100	**Figure 8.2-11** **Typical Treatment Trench Cross Section** **TCD PT-1**

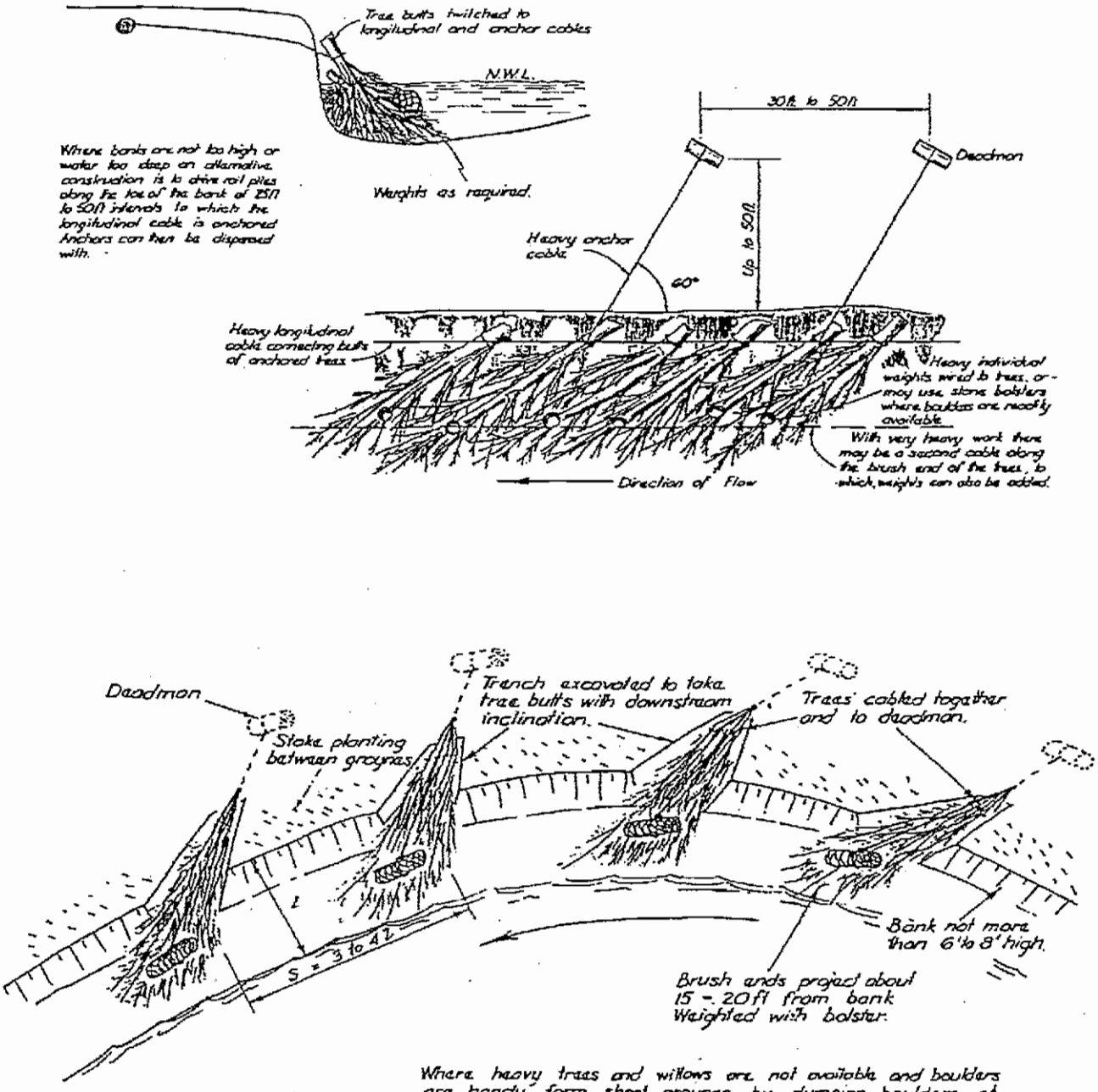


EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4152500.06654.05a Generation: 1 FS-56 092500	**Figure 8.2-12** **Riprap Turning Rock Wall to Protect Eroding Outer Bend** **TCD CD-6**



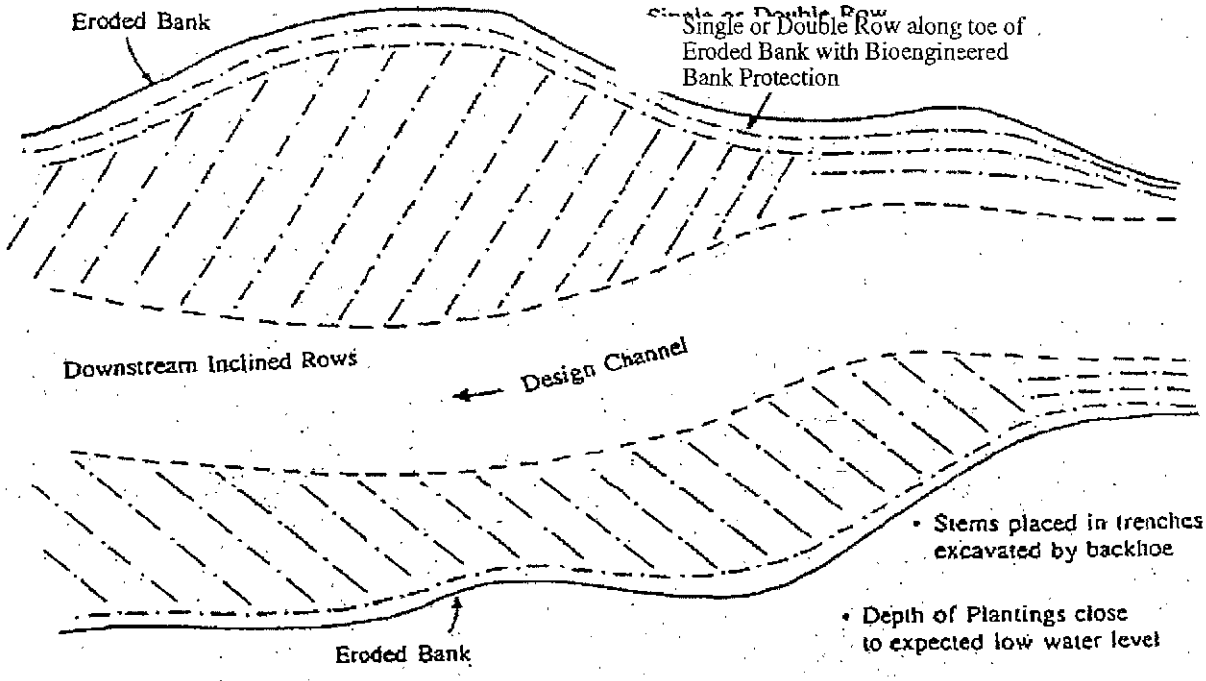
Source: Babakaiff et al.1997

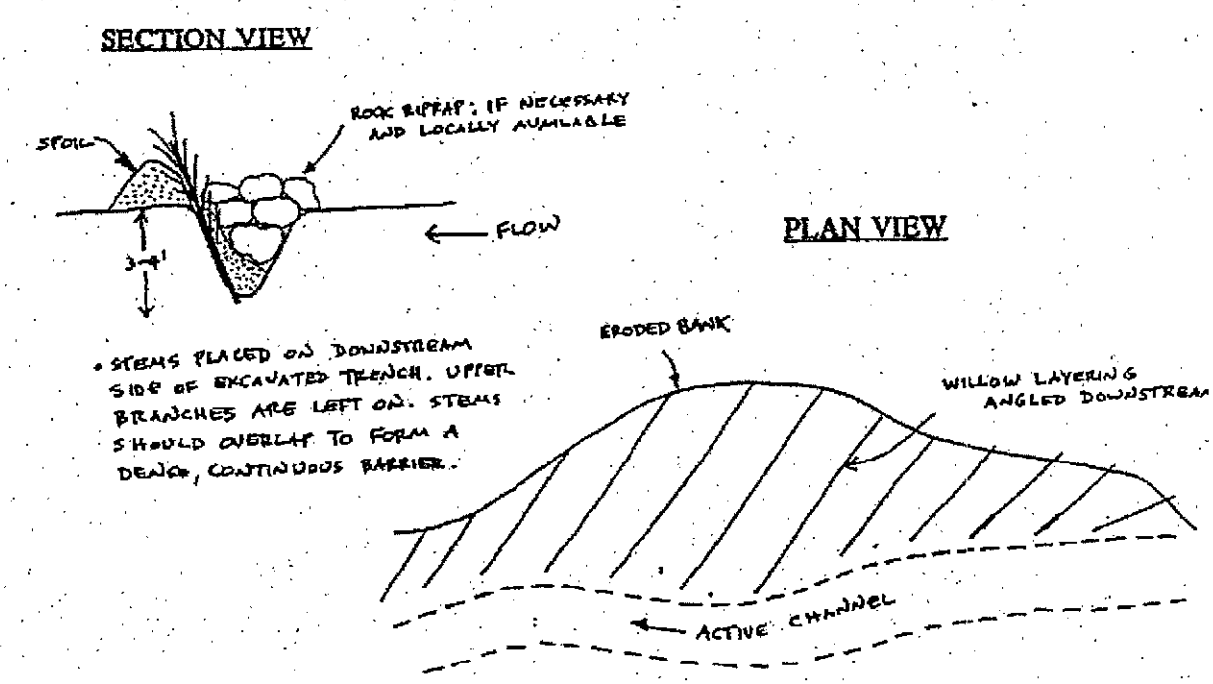
EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-63 042600	**Figure 8.2-13** **Typical Vegetated Geogrid** **TCD BSBR-1**



Source: Matthews 1998

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.05664.05a Generation: 1 FS-68 092500	Figure 8.2-14 Sketch of Tree Deflectors (from Acheson 1968) TCD BSBR-5





Source: Matthews 1996

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-69 092500	**Figure 8.2-15** **Floodplain Plantings** **TCD FP/RP-1**

Table 8.2-1
General Response Actions for the Ecological FS

Media In Process Options Database*	General Response Actions
Mine Water, Seeps, Springs, and Leachate	No Action Institutional Controls Water Collection Water Treatment Mine Closure
Groundwater	No Action Institutional Controls Containment Water Collection Water Treatment Mine Closure
Surface Water	No Action Institutional Controls Containment Water Collection Water Treatment
Upland Waste Rock/Tailings/Soils/Mine Waste	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Submerged Waste Rock/Tailings/Sediments (South Fork Coeur d'Alene River Above Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment

Table 8.2-1 (Continued)
General Response Actions for the Ecological FS

Media In Process Options Database[a]	General Response Actions
Hazardous Wastes	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Water Collection Re-establish Impacted Habitat In Situ Soil Treatment
Floodplain Sediments (Below Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Submerged Sediments (Below Cataldo)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment
Submerged Sediments (Lateral Lakes)	No Action Institutional Controls Containment Soil Removal Ex Situ Soil Treatment Soil Disposal Re-establish Impacted Habitat In Situ Soil Treatment

[a] For the FS analysis, submerged sediments, waste rock, and tailings were evaluated together with floodplain sediments, waste rock, and tailings, respectively, as three media: floodplain sediments, floodplain waste rock, and floodplain tailings.

Table 8.2-2
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Mine Water, Seeps, Springs, and Leachate	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
			Barriers/Barricades
		003 Monitoring	Surface Water Sampling
			Surface Water Gaging and Analysis
	Water Collection	250 Water Collection	Diversion Structures
			Trenches/French Drains/Pipe Drains
		251 Water Transport	Water Pipelines
	Water Treatment	102 Dewatering	Belt Presses (Expression)
		153 Chemical Treatment	Sulfide Precipitation
			Alkaline Precipitation
			Oxidation(includes Aeration for Metals Precipitation)
		154 Physical Treatment	Adsorption using Natural or Synthetic Media
			Microfiltration
			Gravity Filtration
			Coagulation/Flocculation
			Gravity Sedimentation/Clarification
			Flow Equalization
			Permeable Treatment Beds
		155 Biological Treatment	Aerobic Wetland/Surface Flow
			Anaerobic Wetland/Subsurface Flow
			Biotrench
		300 Discharge	Stream/River Discharge
Groundwater	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Groundwater Sampling (well monitoring)
	Containment	054 Vertical Barriers	Vertical Concrete Wall/Slurry Wall
	Water Collection	250 Water Collection	Trenches/French Drains/Pipe Drains
		251 Water Transport	Ditches/Flumes
			Water Pipelines
	Water Treatment	102 Dewatering	Belt Presses (Expression)
		153 Chemical Treatment	Sulfide Precipitation

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Groundwater	Water Treatment	153 Chemical Treatment	Alkaline Precipitation
			Oxidation(includes Aeration for Metals Precipitation)
		154 Physical Treatment	Adsorption using Natural or Synthetic Media
			Microfiltration
			Gravity Filtration
			Coagulation/Flocculation
			Gravity Sedimentation/Clarification
			Flow Equalization
			Permeable Treatment Beds
		155 Biological Treatment	Aerobic Wetland/Surface Flow
			Anaerobic Wetland/Subsurface Flow
			Biotrench
		300 Discharge	Stream/River Discharge
Surface Water	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Surface Water Sampling
			Surface Water Gaging and Analysis
	Water Collection	250 Water Collection	Diversion Structures
		251 Water Transport	Ditches/Flumes
	Water Treatment	300 Discharge	Stream/River Discharge
Upland Waste Rock/Tailings/Soils/Mine Waste	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
		003 Monitoring	Vegetative Cover Sampling
		007 Flood Plain/Land Management	Vegetation Clearing Restrictions
	Containment	051 Consolidation	Backhoes/Loaders
			Scrapers
			Trucks/Trailers
			Bulldozers/Graders
		052 Terrestrial Capping (Capping in the Dry)	Soil
			Flexible Membrane Liners
			Geosynthetic Clay Liners (GCL)

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Upland Waste Rock/Tailings/Soils/Mine Waste	Containment	052 Terrestrial Capping (Capping in the Dry)	Gravel
			Geotextile
		056 Surface Controls/Erosion Controls	Grading
			Diversion/Collection Systems
			Engineered Armoring-Soft
			Vegetative Armoring
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
			Sediment Traps/Ponds
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Scrapers
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Conventional Backfill
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	451 Re-establish Vegetation	Soil Placement/Replacement
			Soil Amendments/Augmentation
			Seeding
			Transplanting
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition
		155 Biological Treatment	Biosolids Application
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
		003 Monitoring	Soil/Sediment Contaminant Sampling
			Vegetative Cover Sampling

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	Institutional Controls	007 Flood Plain/Land Management	Vegetation Clearing Restrictions
			Land Use Agreements
	Containment	051 Consolidation	Backhoes/Loaders
			Scrapers
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
			Bulldozers/Graders
		052 Terrestrial Capping (Capping in the Dry)	Soil
			Flexible Membrane Liners
			Geosynthetic Clay Liners (GCL)
			Gravel
			Geotextile
		054 Vertical Barriers	Vertical Concrete Wall/Slurry Wall
		056 Surface Controls/Erosion Controls	Grading
			Diversion/Collection Systems
			Engineered Armoring-Soft
			Vegetative Armoring
			Stream Deflection/Realignment
			Buffer Strips
			Contour Wattling
			Brush Mattresses or Mats
			Live Stakes
			Tree Revetments
		057 Sediment Transport Controls	Levees/Training Structures
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
			Sediment Traps/Ponds
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	Soil Removal	101 Excavation	Scrapers
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Conventional Backfill
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	450 Re-establish Wildlife Habitat	Plant Appropriate Forage/Feed Species
			Re-establish Refugia
			Establish Greenbelts/Urban Wildlife Habitat/Habitat Buffers
		451 Re-establish Vegetation	Soil Placement/Replacement
			Soil Amendments/Augmentation
			Re-establish Wetlands
			Seeding
			Transplanting
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition
		155 Biological Treatment	Biosolids Application
Submerged Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Soil/Sediment Contaminant Sampling
	Containment	051 Consolidation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
		056 Surface Controls/Erosion Controls	Engineered Armoring-Soft
			Vegetative Armoring
			Stream Deflection/Realignment
			Combined Armoring
			Brush Mattresses or Mats
			Live Stakes

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Submerged Waste Rock/Tailings/Sediments (South Fork Above Cataldo)	Containment	056 Surface Controls/Erosion Controls	Bank Crib and Cover Log
			Tree Revetments
		057 Sediment Transport Controls	Instream Controlled Sediment Deposition
			Sediment/Current Deflectors
		070 Temporary Sediment Control Measures	Best Management Practices for Underwater Sediments
			Silt Curtain Barriers
			Silt Screen Barrier
		053 Subaqueous Capping (Capping Underwater)	Geosynthetic Clay Liners (GCL)
			Gravel
			Clean Sediments
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Conventional Backfill
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	452 Re-establish Aquatic Habitat	Re-establish Refugia
			Provide Shade, Hiding Cover, and Allochthonous Energy
			Large Woody Debris Placement
			Boulder Pools
			Off Channel Pools
			Nurse Logs
			Tree Revetments
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Hazardous Wastes	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
	Containment	051 Consolidation	Backhoes/Loaders
			Trucks/Trailers
			Bulldozers/Graders
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Scrapers
		103 Transport	Trucks/Trailers
		091 Decontamination	Washing
	Soil Disposal	201 Offsite Disposal	RCRA-Subtitle C Facility
Floodplain Sediments (Below Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	002 Access Restrictions	Fences
		003 Monitoring	Soil/Sediment Contaminant Sampling
			Vegetative Cover Sampling
		007 Flood Plain/Land Management	Grazing Controls
			Vegetation Clearing Restrictions
			Wetlands Maintenance
			Land Use Agreements
	Containment	008 Water Level Control	Setback Levees/Compound Channel
		051 Consolidation	Backhoes/Loaders
			Scrapers
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
			Bulldozers/Graders
		052 Terrestrial Capping (Capping in the Dry)	Soil
			Flexible Membrane Liners
			Geosynthetic Clay Liners (GCL)
			Gravel
			Geotextile
		054 Vertical Barriers	Berms/Dikes

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Sediments (Below Cataldo)	Containment	054 Vertical Barriers	Vertical Concrete Wall/Slurry Wall
		056 Surface Controls/Erosion Controls	Diversion/Collection Systems
			Vegetative Armoring
			Buffer Strips
			Brush Mattresses or Mats
			Live Stakes
			Setback Levees/Compound Channel
			Tree Revetments
		057 Sediment Transport Controls	Levees/Training Structures
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
			Bulldozers/Graders
		101 Excavation	Backhoes/Loaders
			Scrapers
			Drag Lines/Clam Shells/Mechanical Dredges
		102 Dewatering	Trenches/French Drains/Pipe Drains
		103 Transport	Trucks/Trailers
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Lake Disposal (Isolated Portion of Coeur d'Alene Lake)
			Lateral Lake Disposal
			Conventional Backfill
			Confined Disposal Facility
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	450 Re-establish Wildlife Habitat	Plant Appropriate Forage/Feed Species
			Re-establish Refugia
			Establish Greenbelts/Urban Wildlife Habitat/Habitat Buffers
		451 Re-establish Vegetation	Soil Placement/Replacement
			Soil Amendments/Augmentation
			Re-establish Wetlands

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Floodplain Sediments (Below Cataldo)	Re-establish Impacted Habitat	451 Re-establish Vegetation	Seeding
			Transplanting
	In-Situ Soil Treatment	152 Immobilization	Phosphate Addition
			Alkaline Addition
		154 Physical Treatment	Deep Tilling
		155 Biological Treatment	Biosolids Application
Submerged River Sediments (Below Cataldo)	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Soil/Sediment Contaminant Sampling
	Containment	056 Surface Controls/Erosion Controls	Vegetative Armoring
			Stream Deflection/Realignment
			Combined Armoring
			Live Stakes
			Tree Revetments
		057 Sediment Transport Controls	Off-line Contaminated Sediment Storage
			Instream Controlled Sediment Deposition
			Sediment/Current Deflectors
		070 Temporary Sediment Control Measures	Best Management Practices for Underwater Sediments
			Silt Curtain Barriers
			Silt Screen Barrier
	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
		101 Excavation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Mechanical/Hydraulic Dredges
			Hydraulic Dredges
		102 Dewatering	Gravity Thickening
		103 Transport	Trucks/Trailers
			Barges/Boats
			Slurry Pipelines
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Submerged River Sediments (Below Cataldo)	Soil Disposal	200 Onsite Disposal	Lake Disposal (Isolated Portion of Coeur d'Alene Lake)
			Lateral Lake Disposal
			Conventional Backfill
			Confined Disposal Facility
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	452 Re-establish Aquatic Habitat	Provide Shade, Hiding Cover, and Allochthonous Energy
Submerged Sediments (Lateral Lakes)	No Action	001 No Action	No Action
	Institutional Controls	003 Monitoring	Soil/Sediment Contaminant Sampling
		007 Flood Plain/Land Management	Vegetation Clearing Restrictions
			Wetlands Maintenance
			Land Use Agreements
	Containment	008 Water Level Control	Modify/Construct Water Level Control Structures-Metals Control
			Modify/Construct Water Level Control Structures-Habitat
		051 Consolidation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Trucks/Trailers
		054 Vertical Barriers	Berms/Dikes
		056 Surface Controls/Erosion Controls	Engineered Armoring-Soft
		070 Temporary Sediment Control Measures	Best Management Practices for Surface Sediments
			Best Management Practices for Underwater Sediments
			Silt Curtain Barriers
			Silt Screen Barrier
		053 Subaqueous Capping (Capping Underwater)	Soil
			Organic Cover
			Gravel
			Clean Sediments
			Sand

Table 8.2-2 (Continued)
Process Options Retained for Use in TCDs

Media	General Response Action	Technology Type	Process Option
Submerged Sediments (Lateral Lakes)	Soil Removal	090 Demolition/Debris Removal	Backhoes/Loaders
		101 Excavation	Backhoes/Loaders
			Drag Lines/Clam Shells/Mechanical Dredges
			Mechanical/Hydraulic Dredges
			Hydraulic Dredges
		102 Dewatering	Gravity Thickening
		103 Transport	Trucks/Trailers
			Barges/Boats
			Slurry Pipelines
	Soil Disposal	200 Onsite Disposal	Constructed Non-RCRA Repository
			Lake Disposal (Isolated Portion of Coeur d'Alene Lake)
			Lateral Lake Disposal
			Conventional Backfill
			Confined Disposal Facility
		201 Offsite Disposal	Constructed Non-RCRA Repository
	Re-establish Impacted Habitat	451 Re-establish Vegetation	Re-establish Wetlands
		452 Re-establish Aquatic Habitat	Re-establish Refugia
			Provide Shade, Hiding Cover, and Allochthonous Energy
			Large Woody Debris Placement
			Nurse Logs
	In-Situ Soil Treatment	155 Biological Treatment	Biosolids Application

Notes: CU = cubic yard
IDEQ = Idaho Department of Environmental Quality

Table 8.2-3
Description of TCDs

TCD	Purpose	Application Criteria
Excavation	Removal of materials from areas where they are subject to erosion or leaching.	Tailings, waste rock mixtures, contaminated floodplain sediments, and waste rock piles that are potentially erodable or significant sources of metals loading.
Regrade/Consolidate/ Vegetative Cover	Isolate waste from human or ecological contact Decrease potential for erosion of waste Doesn't significantly decrease infiltration	Erodable or otherwise unstable waste rock piles without significant leaching potential under Alts 2 and 3. Waste rock with minimal leaching potential under Alt 4. Use C2a where only toe of waste pile is in nominal 100-yr floodplain; C2b where waste pile has largely filled in valley bottom; distinction made for cost estimating purposes. Use C2c where steep slopes prevent placement of vegetative cover (steeper than 1.5H:1V).
Low Permeability Cap	Significantly reduce infiltration	Contaminated sediments, tailings, waste rock and waste rock/tailings mixtures that are potentially significant sources of metals loading under Alt 2. Waste rock and waste rock/tailings mixtures that are not potential significant sources of metals loading under Alts 3 and 4.
Low Permeability Cap with Erosion Protection	Significantly reduce infiltration + minimize erosion of waste below the nominal 100-year flood level at sites where relocation above the flood level could not be implemented due to steep ground slopes.	Waste rock or waste rock/tailings mixtures that are not significant sources of metal loading under Alt 2. Waste rock piles subject to erosion that are remotely located or relatively small sources of metals loading under Alt 3. Would not be used under Alt 4.
Local Repository Above Flood Level	Provide a relatively high degree of protectiveness for wastes that are potentially significant sources of metals loading.	Used for contaminated sediments, tailings, and tailings/waste rock mixtures under Alt 2. Used for tailings and tailings/waste rock mixtures under Alt 3. Used for waste rock with erosion or leaching potential under Alt 4.
Regional Repository	Provide the highest level of protection among the containment TCDs.	Used for tailings and contaminated sediments under Alt 3. More general use under Alt 4, including all tailings, all tailings/waste rock mixtures that are potentially significant sources of metals loading, all floodplain sediments containing levels of metals above PRGs, and all tailings currently contained in abandoned tailings impoundments. May also be used for some lower-level wastes where it is the most cost effective TCD.
Tailings Impoundment Closure	To address the closure of abandoned tailings impoundments or cells under Alternatives 2 and 3.	All abandoned tailings impoundments and cells under Alts 2 and 3.

Table 8.2-3 (Continued)
Description of TCDs

TCD	Purpose	Application Criteria
Hydraulic Isolation Using Slurry Wall	To minimize the discharge of contaminated groundwater to the surface water system, thereby reducing the dissolved metals loading to the surface water system.	Areas where metals impacts to groundwater are not controlled by removal and containment of source materials under Alts 3 and 4.
Hydroxide Precipitation with Media Filtration	To remove heavy metals from an aqueous stream using active treatment.	Active treatment used to provide relatively high metals removal rates and treatment reliability for water containing high metals loads. It would also be used for treating flow rates in excess of those that could practically be treated using passive treatment. Active treatment used under Alts 3 and 4 for adits identified as major loaders, leachate from regional repositories, and contaminated groundwater.
Permeable Reactive Barrier	To remove metals through adsorption/precipitation reactions using apatite or another chemical reagent within a permeable reactive barrier or treatment bed. Typically for oxidizing or low iron conditions.	Generally applicable for lower flow volumes such as drainage from adits, seeps, leachate from repositories, and runoff from waste piles. Used under Alt 2 for adits identified as major loaders. Used under Alts 3 and 4 for adits not identified as major loaders, but discharging metals at levels of concern. Potentially used for leachate from repositories and contaminated groundwater under Alternatives 3 and 4.
Current Deflector	Directs stream energy away from erodable areas, or uses series of deflectors to dissipate stream energy. Creates scour holes, pools and other habitat features. May be oriented to serve as sediment traps.	Apply throughout CSM Units 1 and 2 where stream bank and bedload stabilization, and dissipation of stream energy is desirable.
Bank Stabilization Using Bioengineered Revetments	Protects eroding streambanks or rehabilitates banks after excavation.	Applicable in low to high energy stream environments in CSM Units 1 and 2
Vegetative Bank Stabilization	Stabilizes eroding streambanks or reconstructs them after excavation and removal of bank material. Rock toe prevents undermining.	Applicable in low energy stream environments in CSM Units 2 and 3. May be used in CSM Unit 1 in conjunction with current deflectors.

Table 8.2-4
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Upper Basin					
Floodplain Sediment	Removals of tailings-impacted deposits in the current 100-year floodplain (excluding in-stream deposits) with disposal in local repositories; bank and stream stabilization using bioengineering methods	Same as Alternative 2 plus removal of accessible tailings-impacted deposits on the channel-side of I-90, with disposal in regional repositories;[a] selected areas of hydraulic isolation with treatment of groundwater in a regional water treatment plant[b]	Same as Alternative 3 but with maximum removal of tailings-impacted deposits and maximum use of hydraulic isolation with treatment of groundwater at a regional water treatment plant[c]	Selected removals from the 100-year floodplain, with capping; bioengineering and vegetative stabilization of selected stream banks and floodplains; selected use of riprap.	Limited removals; bank and stream stabilization using bioengineering methods
Tailings Piles/ Impoundments	Regrading and capping in place, as practical; otherwise, removal with disposal in on site or local repositories. Hydraulic isolation used for the Hecla-Star tailings impoundments in Canyon Creek	Similar to Alternative 2 but greater use of removals with disposal in on-site, local, or regional repositories; and greater use of hydraulic isolation	Maximum excavation and use of regional repositories	Removal from the 100-year floodplain with disposal in local or regional repositories; in-place closure of existing impoundments	Soil cover in place; limited removal (Hecla-Star complex at Burke) with disposal in an offsite repository
Upper Basin					
Waste Rock Piles	Within the 100-year floodplain, in-place regrading and capping, as practical, or removal; no action otherwise	Similar to Alternative 2 but with more removal and less regrading	Removal from the 100-yr floodplain with disposal in regional repositories; regrading and vegetative cover otherwise	Regrading or relocation out of the 100-year floodplain, with selected capping	Removal from the 100-yr floodplain; no action otherwise

Table 8.2-4 (Continued)
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Upper Basin (Continued)					
Adits	Major load sources—Treatment using passive, on-site technologies Minor load sources—No action	Major Load Sources—Collection and conveyance to a regional water treatment plant Minor Load Sources—Treatment using passive, on-site technologies	Major load sources—Same as Alternative 3, but applied to more adits Minor load sources—Same as Alternative 3, but applied to more adits	Major load sources (14 total)—Treatment using passive, on-site technologies Minor load sources—No action	Major load sources—Infiltration and water level control followed by wetland treatment if necessary Minor load sources—No action
Lower Basin					
River Banks and Levees	Partial removal of contaminated "bank wedges" with disposal in a regional repository at Cataldo/Mission Flats	Complete removal of contaminated "bank wedges;" disposal in a regional repository at Cataldo/Mission Flats or consolidation using CAD (confined aquatic disposal) in one or more of the lateral lakes	Same as Alternative 3	Partial removal and stabilization by grading and bioengineering. Implementation of a river management plan to prevent unacceptable erosion of the banks.	Revegetation, bioengineering, and limited removals based on susceptibility of banks to erosion.
River Bed	No action	Complete removal of affected sediments; same disposal options as for river banks and levees	Same as Alternative 3	Partial removal and disposal of contaminated sediments to eliminate hot spots and create hydraulic capacity as needed.	No action

Table 8.2-4 (Continued)
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Lower Basin (Continued)					
Wetlands	Strobl Marsh and Thompson Marsh—Limited removals, capping and protective dikes to control potential re-contamination from flood events	Strobl Marsh, Campbell Marsh, Orling Slough, Hidden Marsh, Moffit Slough, Thompson Marsh, Lane Marsh, and wetland areas of Thompson, Killarney, Swan, and Medicine Lakes—Sediment removal; same disposal options as for river removals; revegetation with native plants and soil amendments	Maximum sediment removal; revegetation with native plants and soil amendments; disposal same as for Alternative 3	Spot removals, capping and/or chemical treatments and re-vegetation in areas with high lead concentrations and high use by water fowl, including within or surrounding Orling Slough, Strobl Marsh, Lane Marsh (including seven splay areas), Hidden Marsh, Campbell Marsh, Thompson Marsh, Moffit Slough; Medicine Lake, Swan Lake, and Thompson Lake.	Habitat shifting techniques, and consideration of selective in situ chemical stabilization and/or capping with biosolid material of some of the most lead-enriched sediments
Lateral Lakes	Thompson Lake—Dredging from the shore to a water depth of approximately 6 feet with disposal in a repository adjacent to the lake	Thompson, Killarney, Swan, and Medicine Lakes—Dredging from the shore to water depths of about six feet; same disposal options as for river removals	Maximum dredging; disposal same as for Alternative 3	Included with wetlands	Similar to wetlands

Table 8.2-4 (Continued)
Summary of Ecological Alternatives Developed for the Upper and Lower Basins

Source/Area	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
Lower Basin (Continued)					
Other Floodplain Areas	Soil amendments to promote vegetation for erosion control and chemical stabilization to reduce metal availability to ecological receptors and transport to surface water	Sediment removal; disposal in a local repository at Cataldo/Mission Flats; revegetation with native plants and soil amendments	Same as wetlands	Soil treatment and re-vegetation for highly contaminated areas	Similar to wetlands
Cataldo/Mission Flats	Hydraulic isolation (using a groundwater cutoff wall with a reactive barrier for passive in situ treatment of groundwater); surface water diversion structures, as needed; amend soils to provide a suitable growth medium combined with planting of suitable vegetation. Construction of an engineered repository for disposal of river bank, levee, and wetland removals.	Same as Alternative 2 except treatment of groundwater at a regional water treatment plant	Removal and disposal in an on-site regional repository	Groundwater cutoff walls; spot removals, soil treatment and re-vegetation	No action

[a] Regional repositories in Canyon Creek, Ninemile Creek, and along the South Fork Coeur d'Alene River, in addition to the Lower Basin
[b] Active water treatment assumes high-density sludge hydroxide precipitation with media filtration, processes that are similar to what is being used for the BHSS Central Treatment Plant. It is assumed that the regional treatment plant would be located near Pinehurst. Pipelines would be used in Canyon Creek, Ninemile Creek, and the South Fork Coeur d'Alene River to transport collected adit discharge and groundwater to the regional treatment plant. Collected groundwater from the Cataldo/Mission Flats dredge disposal area would be pumped to the regional treatment plant.
[c] One plant located near Pinehurst as for Alternative 3

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Sediments										
	C01B	Sediment Excavation								
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	19,000	$10.00	$190,000	$110,000	$0	$300,000
					Totals for TCD# C01B . . .		$290,000	$170,000	$0	$460,000
	C07	Local Repository Above Flood Level								
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$9.70	$97,000	$58,000	$22,000	$180,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	19,000	$9.70	$180,000	$110,000	$42,000	$340,000
					Totals for TCD# C07 . . .		$280,000	$170,000	$63,000	$510,000
					Totals for Floodplain Sediments . . .		*$570,000*	*$340,000*	*$63,000*	*$980,000*
Floodplain Tailings										
	C09	Tailings Impoundment Closure								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	AC	6	$170,000.00	$940,000	$570,000	$190,000	$1,700,000
					Totals for TCD# C09 . . .		$940,000	$570,000	$190,000	$1,700,000
					Totals for Floodplain Tailings . . .		*$940,000*	*$570,000*	*$190,000*	*$1,700,000*
Upland Tailings										
	C03	Low Permeability Cap								
		BUR173	TAMARACK MILLSITE	AC	1	$151,000.00	$150,000	$88,000	$18,000	$250,000
		OSB039	DAYROCK MINE	AC	1	$151,000.00	$110,000	$63,000	$13,000	$180,000
					Totals for TCD# C03 . . .		$250,000	$150,000	$32,000	$430,000
	C09	Tailings Impoundment Closure								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	3	$170,000.00	$430,000	$260,000	$85,000	$770,000
					Totals for TCD# C09 . . .		$430,000	$260,000	$85,000	$770,000
	C11	Hydraulic Isolation Using Slurry Wall								
		OSB044	SUCCESS MINE ROCK DUMP	LF	1,400	$280.00	$390,000	$240,000	$160,000	$780,000
					Totals for TCD# C11 . . .		$390,000	$240,000	$160,000	$780,000
					Totals for Upland Tailings . . .		*$1,100,000*	*$640,000*	*$270,000*	*$2,000,000*
Floodplain Waste Rock										
	C02a	Regrade/Consolidate/Revegetate								
		OSB032	DULUTH MINE BLACKCLOUD CK	AC	1	$56,000.00	$47,000	$28,000	$5,900	$81,000

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		OSB038	CALIFORNIA NO.4	AC	1	$56,000.00	$72,000	$43,000	$9,000	$120,000
		OSB082	MONARCH MINE BLACKCLOUD CK	AC	1	$56,000.00	$30,000	$18,000	$3,800	$52,000
						Totals for TCD# C02a . . .	**$150,000**	**$89,000**	**$19,000**	**$260,000**
						Totals for Floodplain Waste Rock . . .	*$150,000*	*$89,000*	*$19,000*	*$260,000*
Upland Waste Rock										
	C02a	Regrade/Consolidate/Revegetate								
		BUR052	LITTLE SUNSET MINE	AC	0	$56,000.00	$9,000	$5,400	$1,100	$15,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	21	$56,000.00	$1,200,000	$720,000	$150,000	$2,100,000
		BUR139	REX NO.1	AC	1	$56,000.00	$73,000	$44,000	$9,200	$130,000
		OSB033	RUTH MINE	AC	1	$56,000.00	$38,000	$23,000	$4,800	$66,000
		OSB115	OPTION MINE	AC	0	$56,000.00	$19,000	$11,000	$2,400	$33,000
		WAL006	NORTHSIDE MINE	AC	0	$56,000.00	$14,000	$8,400	$1,800	$24,000
						Totals for TCD# C02a . . .	**$1,400,000**	**$810,000**	**$170,000**	**$2,300,000**
	C02b	Regrade/Consolidate/Revegetate								
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	AC	8	$110,000.00	$930,000	$560,000	$120,000	$1,600,000
		BUR160	INTERSTATE-CALLAHAN LOWER ROCK DUMPS	AC	4	$110,000.00	$460,000	$280,000	$58,000	$800,000
		BUR170	TAMARACK 400 LEVEL	AC	1	$110,000.00	$100,000	$63,000	$13,000	$180,000
		BUR171	TAMARACK NO.5	AC	1	$110,000.00	$73,000	$44,000	$9,100	$130,000
		BUR172	TAMARACK UNNAMED ADIT	AC	0	$110,000.00	$47,000	$28,000	$5,900	$82,000
						Totals for TCD# C02b . . .	**$1,600,000**	**$970,000**	**$200,000**	**$2,800,000**
						Totals for Upland Waste Rock . . .	*$3,000,000*	*$1,800,000*	*$370,000*	*$5,100,000*
Adit Drainage										
	C10	Adit Drainage Collection								
		OSB089	SUCCESS NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
						Totals for TCD# C10 . . .	**$6,200**	**$3,700**	**$1,100**	**$11,000**
	PT-1a	Permeable Reactive Trench								
		OSB089	SUCCESS NO.3	CY	200	$440.00	$88,000	$53,000	$530,000	$670,000
						Totals for TCD# PT-1a . . .	**$88,000**	**$53,000**	**$530,000**	**$670,000**
						Totals for Adit Drainage . . .	*$94,000*	*$57,000*	*$530,000*	*$680,000*

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Groundwater										
	PT-1a	Permeable Reactive Trench								
		OSB044	SUCCESS MINE ROCK DUMP	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
					Totals for TCD# PT-1a . . .		$4,400	$2,600	$26,000	$33,000
					Totals for Groundwater . . .		*$4,400*	*$2,600*	*$26,000*	*$33,000*
General										
	ACC-1	Temporary Access Road								
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	3	$200,000.00	$500,000	$300,000	$0	$800,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
					Totals for TCD# ACC-1 . . .		$800,000	$480,000	$0	$1,300,000
	HAUL-1	Haul to Local Repository, 1/2 Mile One Way								
		LHAULNM	Hauling to Local Repository	CY-MI	5,000	$0.89	$4,500	$2,700	$0	$7,100
		LHAULNM	Hauling to Local Repository	CY-MI	9,500	$0.89	$8,500	$5,100	$0	$14,000
					Totals for TCD# HAUL-1 . . .		$13,000	$7,800	$0	$21,000
					Totals for General . . .		*$810,000*	*$490,000*	*$0*	*$1,300,000*
Buildings & Structures										
	HH-1	Fence waste pile/mill site								
		OSB039	DAYROCK MINE	LF	4,000	$25.00	$100,000	$60,000	$10,000	$170,000
					Totals for TCD# HH-1 . . .		$100,000	$60,000	$10,000	$170,000
					Totals for Buildings & Structures . . .		*$100,000*	*$60,000*	*$10,000*	*$170,000*
Bioengineering Actions										
	BSBR-AV	Bank Stabilization via Revetments - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	2,400	$83.00	$200,000	$120,000	$60,000	$380,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$83.00	$630,000	$380,000	$190,000	$1,200,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$83.00	$170,000	$100,000	$52,000	$330,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$83.00	$60,000	$36,000	$18,000	$110,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$83.00	$460,000	$280,000	$140,000	$880,000
					Totals for TCD# BSBR-AVG . . .		$1,500,000	$910,000	$460,000	$2,900,000

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	CD-AVG	**Current Deflector Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	29	$1,380.00	$40,000	$24,000	$12,000	$76,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	54	$1,380.00	$75,000	$45,000	$22,000	$140,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	15	$1,380.00	$21,000	$12,000	$6,200	$39,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	5	$1,380.00	$6,900	$4,100	$2,100	$13,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	40	$1,380.00	$55,000	$33,000	$17,000	$100,000
					Totals for TCD# CD-AVG . . .		**$200,000**	**$120,000**	**$59,000**	**$370,000**
	CD-SED	**Current Deflector Sediment Traps**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	3	$1,380.00	$4,100	$2,500	$24,000	$31,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	6	$1,380.00	$8,300	$5,000	$48,000	$61,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	2	$1,380.00	$2,800	$1,700	$16,000	$20,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	1	$1,380.00	$1,400	$830	$8,000	$10,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	4	$1,380.00	$5,500	$3,300	$32,000	$41,000
					Totals for TCD# CD-SED . . .		**$22,000**	**$13,000**	**$130,000**	**$160,000**
	CH REAL	**Channel Realignment**								
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	28,000	$29.00	$800,000	$480,000	$140,000	$1,400,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SY	74,000	$29.00	$2,100,000	$1,300,000	$380,000	$3,800,000
					Totals for TCD# CH REAL-1 . . .		**$2,900,000**	**$1,800,000**	**$520,000**	**$5,200,000**
	FP/RP-AV	**Floodplain and Riparian Replanting - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	SF	80,000	$0.94	$75,000	$45,000	$13,000	$130,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SF	380,000	$0.94	$350,000	$210,000	$62,000	$630,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SF	280,000	$0.94	$260,000	$160,000	$46,000	$460,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SF	100,000	$0.94	$97,000	$58,000	$17,000	$170,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SF	140,000	$0.94	$130,000	$81,000	$24,000	$240,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SF	560,000	$0.94	$520,000	$310,000	$91,000	$930,000
					Totals for TCD# FP/RP-AVG . . .		**$1,400,000**	**$870,000**	**$250,000**	**$2,600,000**
	VBS-AVG	**Vegetative Bank Stabilization - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$36.00	$140,000	$87,000	$43,000	$270,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$36.00	$270,000	$160,000	$82,000	$520,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$36.00	$74,000	$45,000	$22,000	$140,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$36.00	$26,000	$15,000	$7,700	$49,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$36.00	$200,000	$120,000	$60,000	$380,000

Table 8.2-5
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 2
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source	Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
				Totals for TCD# VBS-AVG . . .		$720,000	$430,000	$210,000	$1,400,000
				Totals for Bioengineering Actions . . .		*$6,800,000*	*$4,100,000*	*$1,600,000*	*$13,000,000*
				Totals for Nine Mile Creek . . .		$14,000,000	$8,100,000	$3,100,000	$25,000,000

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Sediments										
	C01B	Sediment Excavation								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$10.00	$55,000	$33,000	$0	$88,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB039	DAYROCK MINE	CY	11,000	$10.00	$110,000	$66,000	$0	$180,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	17,000	$10.00	$170,000	$100,000	$0	$270,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$10.00	$130,000	$78,000	$0	$210,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$10.00	$330,000	$200,000	$0	$530,000
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$10.00	$8,000	$4,800	$0	$13,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	33,000	$10.00	$330,000	$200,000	$0	$530,000
					Totals for TCD# C01B . . .		**$1,400,000**	**$820,000**	**$0**	**$2,200,000**
	C07	Local Repository Above Flood Level								
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$9.70	$7,800	$4,700	$1,700	$14,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	33,000	$9.70	$320,000	$190,000	$72,000	$580,000
					Totals for TCD# C07 . . .		**$330,000**	**$200,000**	**$74,000**	**$600,000**
	C08	Regional Repository								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$16.00	$88,000	$53,000	$22,000	$160,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$16.00	$160,000	$96,000	$40,000	$300,000
		OSB039	DAYROCK MINE	CY	11,000	$16.00	$180,000	$110,000	$44,000	$330,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	17,000	$16.00	$270,000	$160,000	$68,000	$500,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$16.00	$160,000	$96,000	$40,000	$300,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$16.00	$26,000	$15,000	$6,400	$47,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$16.00	$210,000	$120,000	$52,000	$380,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$16.00	$26,000	$15,000	$6,400	$47,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$16.00	$530,000	$320,000	$130,000	$980,000
					Totals for TCD# C08 . . .		**$1,600,000**	**$990,000**	**$410,000**	**$3,000,000**
					Totals for Floodplain Sediments . . .		*$3,300,000*	*$2,000,000*	*$480,000*	*$5,800,000*

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Tailings										
	C09	Tailings Impoundment Closure								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	AC	6	$170,000.00	$940,000	$570,000	$190,000	$1,700,000
					Totals for TCD# C09 . . .		$940,000	$570,000	$190,000	$1,700,000
					Totals for Floodplain Tailings . . .		*$940,000*	*$570,000*	*$190,000*	*$1,700,000*
Upland Tailings										
	C01	Excavation								
		OSB039	DAYROCK MINE	CY	11,000	$2.70	$30,000	$18,000	$0	$48,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$2.70	$970,000	$580,000	$0	$1,600,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$2.70	$19,000	$11,000	$0	$30,000
					Totals for TCD# C01 . . .		$1,000,000	$610,000	$0	$1,600,000
	C07	Local Repository Above Flood Level								
		BUR055	INTERSTATE MILLSITE	CY	14,000	$9.70	$140,000	$81,000	$31,000	$250,000
		OSB039	DAYROCK MINE	CY	11,000	$9.70	$110,000	$64,000	$24,000	$190,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$9.70	$68,000	$41,000	$15,000	$120,000
					Totals for TCD# C07 . . .		$310,000	$190,000	$70,000	$570,000
	C08	Regional Repository								
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$16.00	$5,800,000	$3,500,000	$1,400,000	$11,000,000
					Totals for TCD# C08 . . .		$5,800,000	$3,500,000	$1,400,000	$11,000,000
	C09	Tailings Impoundment Closure								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	3	$170,000.00	$430,000	$260,000	$85,000	$770,000
					Totals for TCD# C09 . . .		$430,000	$260,000	$85,000	$770,000
					Totals for Upland Tailings . . .		*$7,500,000*	*$4,500,000*	*$1,600,000*	*$14,000,000*
Floodplain Waste Rock										
	C01	Excavation								
		OSB032	DULUTH MINE BLACKCLOUD CK	CY	4,000	$2.70	$11,000	$6,500	$0	$17,000
		OSB038	CALIFORNIA NO.4	CY	6,200	$2.70	$17,000	$10,000	$0	$27,000
		OSB082	MONARCH MINE BLACKCLOUD CK	CY	2,600	$2.70	$7,000	$4,200	$0	$11,000
					Totals for TCD# C01 . . .		$35,000	$21,000	$0	$55,000

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	C03	Low Permeability Cap								
		OSB032	DULUTH MINE BLACKCLOUD CK	AC	1	$151,000.00	$130,000	$76,000	$16,000	$220,000
		OSB038	CALIFORNIA NO.4	AC	1	$151,000.00	$190,000	$120,000	$24,000	$330,000
		OSB082	MONARCH MINE BLACKCLOUD CK	AC	1	$151,000.00	$82,000	$49,000	$10,000	$140,000
						Totals for TCD# C03 . . .	**$400,000**	**$240,000**	**$50,000**	**$690,000**
					Totals for Floodplain Waste Rock . . .		*$440,000*	*$260,000*	*$50,000*	*$750,000*
Upland Waste Rock										
	C01	Excavation								
		BUR052	LITTLE SUNSET MINE	CY	800	$2.70	$2,200	$1,300	$0	$3,500
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	690,000	$2.70	$1,900,000	$1,100,000	$0	$3,000,000
		OSB033	RUTH MINE	CY	3,200	$2.70	$8,600	$5,200	$0	$14,000
		OSB115	OPTION MINE	CY	40	$2.70	$110	$65	$0	$170
		WAL006	NORTHSIDE MINE	CY	40	$2.70	$110	$65	$0	$170
						Totals for TCD# C01 . . .	**$1,900,000**	**$1,100,000**	**$0**	**$3,000,000**
	C02a	Regrade/Consolidate/Revegetate								
		OSB044	SUCCESS MINE ROCK DUMP	AC	0	$56,000.00	$25,000	$15,000	$3,200	$43,000
						Totals for TCD# C02a . . .	**$25,000**	**$15,000**	**$3,200**	**$43,000**
	C02b	Regrade/Consolidate/Revegetate								
		BUR056	TAMARACK ROCK DUMPS	AC	13	$110,000.00	$1,500,000	$880,000	$180,000	$2,500,000
						Totals for TCD# C02b . . .	**$1,500,000**	**$880,000**	**$180,000**	**$2,500,000**
	C03	Low Permeability Cap								
		BUR052	LITTLE SUNSET MINE	AC	0	$151,000.00	$24,000	$14,000	$3,000	$42,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	AC	21	$151,000.00	$3,200,000	$1,900,000	$400,000	$5,600,000
		BUR139	REX NO.1	AC	1	$151,000.00	$200,000	$120,000	$25,000	$340,000
		BUR170	TAMARACK 400 LEVEL	AC	1	$151,000.00	$140,000	$86,000	$18,000	$250,000
		BUR171	TAMARACK NO.5	AC	1	$151,000.00	$100,000	$60,000	$12,000	$170,000
		BUR172	TAMARACK UNNAMED ADIT	AC	0	$151,000.00	$65,000	$39,000	$8,100	$110,000
		OSB033	RUTH MINE	AC	1	$151,000.00	$100,000	$62,000	$13,000	$180,000
		OSB115	OPTION MINE	AC	0	$151,000.00	$51,000	$31,000	$6,400	$89,000
		WAL006	NORTHSIDE MINE	AC	0	$151,000.00	$38,000	$23,000	$4,700	$65,000
						Totals for TCD# C03 . . .	**$4,000,000**	**$2,400,000**	**$490,000**	**$6,800,000**

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	C04	Low Perm Cap w/Seepage Coll & Trmt								
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	AC	8	$170,000.00	$1,400,000	$860,000	$320,000	$2,600,000
		BUR160	INTERSTATE-CALLAHAN LOWER ROCK DUMPS	AC	4	$170,000.00	$710,000	$430,000	$160,000	$1,300,000
						Totals for TCD# C04 . . .	$2,200,000	$1,300,000	$480,000	$3,900,000
						Totals for Upland Waste Rock . . .	*$9,500,000*	*$5,700,000*	*$1,200,000*	*$16,000,000*
Adit Drainage										
	C10	Adit Drainage Collection								
		BUR051	SUNSET MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR058	TAMARACK NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR170	TAMARACK 400 LEVEL	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR171	TAMARACK NO.5	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB039	DAYROCK MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB088	ALAMEDA MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB089	SUCCESS NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
						Totals for TCD# C10 . . .	$50,000	$30,000	$8,700	$88,000
	PT-1a	Permeable Reactive Trench								
		BUR051	SUNSET MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR058	TAMARACK NO.3	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR170	TAMARACK 400 LEVEL	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR171	TAMARACK NO.5	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB039	DAYROCK MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB088	ALAMEDA MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
						Totals for TCD# PT-1a . . .	$31,000	$18,000	$180,000	$230,000
	TRMT-1	Media Filter Treatment Plant								
		OSB089	SUCCESS NO.3	GPM	16	$1,190.00	$19,000	$14,000	$37,000	$70,000
						Totals for TCD# TRMT-1 . . .	$19,000	$14,000	$37,000	$70,000
						Totals for Adit Drainage . . .	*$99,000*	*$62,000*	*$230,000*	*$390,000*

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
General										
	ACC-1	**Temporary Access Road**								
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	3	$200,000.00	$500,000	$300,000	$0	$800,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$100,000	$60,000	$0	$160,000
					Totals for TCD# ACC-1 . . .		**$800,000**	**$480,000**	**$0**	**$1,300,000**
	HAUL-1	**Haul to Local Repository, 1/2 Mile One Way**								
		LHAULNM	Hauling to Local Repository	CY-MI	7,000	$0.89	$6,200	$3,700	$0	$10,000
		LHAULNM	Hauling to Local Repository	CY-MI	26,000	$0.89	$23,000	$14,000	$0	$37,000
					Totals for TCD# HAUL-1 . . .		**$29,000**	**$18,000**	**$0**	**$47,000**
	HAUL-2	**Haul to Regional Repository**								
		RHAULNM	Hauling to Regional Repository	CY-MI	70,000	$0.89	$62,000	$37,000	$0	$100,000
		RHAULNM	Hauling to Regional Repository	CY-MI	1,200,000	$0.89	$1,100,000	$650,000	$0	$1,700,000
		RHAULNM	Hauling to Regional Repository	CY-MI	44,000	$0.89	$39,000	$23,000	$0	$63,000
					Totals for TCD# HAUL-2 . . .		**$1,200,000**	**$720,000**	**$0**	**$1,900,000**
	PIPE-1	**Conveyance Pipeline-6"**								
		PIPENM02	Pipeline to Active Treatment	LF	8,200	$39.00	$320,000	$190,000	$24,000	$540,000
		PIPENM04	Pipeline to Active Treatment	LF	16,000	$39.00	$630,000	$380,000	$47,000	$1,100,000
					Totals for TCD# PIPE-1 . . .		**$950,000**	**$570,000**	**$71,000**	**$1,600,000**
					Totals for General . . .		*$3,000,000*	*$1,800,000*	*$71,000*	*$4,800,000*
Buildings & Structures										
	HH-3	**Decon millsite**								
		OSB039	DAYROCK MINE	LS	1	$100,000.00	$100,000	$60,000	$5,000	$170,000
					Totals for TCD# HH-3 . . .		**$100,000**	**$60,000**	**$5,000**	**$170,000**
					Totals for Buildings & Structures . . .		*$100,000*	*$60,000*	*$5,000*	*$170,000*
Bioengineering Actions										
	BSBR-AV	**Bank Stabilization via Revetments - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$83.00	$330,000	$200,000	$100,000	$630,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$83.00	$630,000	$380,000	$190,000	$1,200,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$83.00	$170,000	$100,000	$52,000	$330,000

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Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$83.00	$60,000	$36,000	$18,000	$110,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$83.00	$460,000	$280,000	$140,000	$880,000
					Totals for TCD# BSBR-AVG . . .		$1,700,000	$990,000	$500,000	$3,100,000
	CD-AVG	Current Deflector Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	48	$1,380.00	$66,000	$40,000	$20,000	$130,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	90	$1,380.00	$120,000	$75,000	$37,000	$240,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	EA	33	$1,380.00	$46,000	$27,000	$14,000	$87,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	25	$1,380.00	$35,000	$21,000	$10,000	$66,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	9	$1,380.00	$12,000	$7,500	$3,700	$24,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	67	$1,380.00	$92,000	$55,000	$28,000	$180,000
					Totals for TCD# CD-AVG . . .		$380,000	$230,000	$110,000	$710,000
	CD-SED	Current Deflector Sediment Traps								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	5	$1,380.00	$6,900	$4,100	$40,000	$51,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	10	$1,380.00	$14,000	$8,300	$80,000	$100,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	EA	4	$1,380.00	$5,500	$3,300	$32,000	$41,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	3	$1,380.00	$4,100	$2,500	$24,000	$31,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	1	$1,380.00	$1,400	$830	$8,000	$10,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	7	$1,380.00	$9,700	$5,800	$56,000	$71,000
					Totals for TCD# CD-SED . . .		$41,000	$25,000	$240,000	$310,000
	CH REAL	Channel Realignment								
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	28,000	$29.00	$800,000	$480,000	$140,000	$1,400,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SY	9,600	$29.00	$280,000	$170,000	$49,000	$490,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SY	74,000	$29.00	$2,100,000	$1,300,000	$380,000	$3,800,000
					Totals for TCD# CH REAL-1 . . .		$3,200,000	$1,900,000	$560,000	$5,700,000
	FP/RP-AV	Floodplain and Riparian Replanting - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	SF	200,000	$0.94	$190,000	$110,000	$33,000	$330,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SF	380,000	$0.94	$350,000	$210,000	$62,000	$630,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SF	460,000	$0.94	$440,000	$260,000	$76,000	$770,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SF	140,000	$0.94	$140,000	$82,000	$24,000	$240,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SF	140,000	$0.94	$130,000	$81,000	$24,000	$240,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SF	670,000	$0.94	$630,000	$380,000	$110,000	$1,100,000
					Totals for TCD# FP/RP-AVG . . .		$1,900,000	$1,100,000	$330,000	$3,300,000

Table 8.2-6
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 3
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	OFFCH-A	**Off-Channel Hydrologic Feature Average Cost**								
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SY	350	$29.00	$10,000	$6,000	$1,800	$18,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SY	1,300	$29.00	$38,000	$23,000	$6,700	$68,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	2,000	$29.00	$57,000	$34,000	$10,000	$100,000
					Totals for TCD# OFFCH-AVG . . .		**$110,000**	**$63,000**	**$18,000**	**$190,000**
	VBS-AVG	**Vegetative Bank Stabilization - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$36.00	$140,000	$87,000	$43,000	$270,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$36.00	$270,000	$160,000	$82,000	$520,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	LF	3,200	$36.00	$120,000	$70,000	$35,000	$220,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$36.00	$74,000	$45,000	$22,000	$140,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$36.00	$26,000	$15,000	$7,700	$49,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$36.00	$200,000	$120,000	$60,000	$380,000
					Totals for TCD# VBS-AVG . . .		**$830,000**	**$500,000**	**$250,000**	**$1,600,000**
					Totals for Bioengineering Actions . . .		*$8,100,000*	*$4,900,000*	*$2,000,000*	*$15,000,000*
					Totals for Nine Mile Creek . . .		**$33,000,000**	**$20,000,000**	**$5,800,000**	**$59,000,000**

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
Floodplain Sediments										
	C01B	Sediment Excavation								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$10.00	$55,000	$33,000	$0	$88,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB039	DAYROCK MINE	CY	22,000	$10.00	$220,000	$130,000	$0	$350,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	19,000	$10.00	$190,000	$110,000	$0	$300,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$10.00	$100,000	$60,000	$0	$160,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$10.00	$130,000	$78,000	$0	$210,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$10.00	$16,000	$9,600	$0	$26,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$10.00	$330,000	$200,000	$0	$530,000
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$10.00	$8,000	$4,800	$0	$13,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	34,000	$10.00	$340,000	$200,000	$0	$540,000
					Totals for TCD# C01B . . .		**$1,500,000**	**$900,000**	**$0**	**$2,400,000**
	C08	Regional Repository								
		BUR055	INTERSTATE MILLSITE	CY	5,500	$10.80	$59,000	$36,000	$12,000	$110,000
		BUR140	NINEMILE CREEK IMPACTED FLOODPLAIN	CY	10,000	$10.80	$110,000	$65,000	$22,000	$190,000
		OSB039	DAYROCK MINE	CY	22,000	$10.80	$240,000	$140,000	$48,000	$430,000
		OSB040	EF NINEMILE CK HECLA REHAB	CY	19,000	$10.80	$210,000	$120,000	$41,000	$370,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	10,000	$10.80	$110,000	$65,000	$22,000	$190,000
		OSB056	EF NINEMILE CK IMPACTED RIPARIAN	CY	1,600	$10.80	$17,000	$10,000	$3,500	$31,000
		OSB057	EF NINEMILE CK IMPACTED RIPARIAN	CY	13,000	$10.80	$140,000	$84,000	$28,000	$250,000
		OSB058	EF NINEMILE CK SVNRT REHAB	CY	1,600	$10.80	$17,000	$10,000	$3,500	$31,000
		OSB059	NINEMILE CK BELOW DAYROCK MINE	CY	33,000	$10.80	$360,000	$210,000	$71,000	$640,000
		OSB060	NINEMILE CK SVNRT REHAB NEAR BLACKCLD	CY	800	$10.80	$8,600	$5,200	$1,700	$16,000
		WAL033	NINEMILE CK POTENTIAL TAILINGS DEPOSIT	CY	34,000	$10.80	$370,000	$220,000	$73,000	$660,000
					Totals for TCD# C08 . . .		**$1,600,000**	**$980,000**	**$330,000**	**$2,900,000**
					Totals for Floodplain Sediments . . .		*$3,100,000*	*$1,900,000*	*$330,000*	*$5,300,000*
Floodplain Tailings										
	C01	Excavation								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	CY	200,000	$2.70	$540,000	$320,000	$0	$860,000
					Totals for TCD# C01 . . .		**$540,000**	**$320,000**	**$0**	**$860,000**

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Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
	C08	Regional Repository								
		OSB052	DAYROCK MINE TLGS PILE/SVNRT REPOSITOR	CY	200,000	$10.80	$2,200,000	$1,300,000	$430,000	$3,900,000
					Totals for TCD# C08 . . .		**$2,200,000**	**$1,300,000**	**$430,000**	**$3,900,000**
					Totals for Floodplain Tailings . . .		*$2,700,000*	*$1,600,000*	*$430,000*	*$4,800,000*
Upland Tailings										
	C01	Excavation								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	230,000	$2.70	$610,000	$360,000	$0	$970,000
		BUR055	INTERSTATE MILLSITE	CY	14,000	$2.70	$38,000	$23,000	$0	$60,000
		OSB039	DAYROCK MINE	CY	11,000	$2.70	$30,000	$18,000	$0	$48,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$2.70	$970,000	$580,000	$0	$1,600,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$2.70	$19,000	$11,000	$0	$30,000
					Totals for TCD# C01 . . .		**$1,700,000**	**$1,000,000**	**$0**	**$2,700,000**
	C08	Regional Repository								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	230,000	$10.80	$2,400,000	$1,500,000	$490,000	$4,400,000
		BUR055	INTERSTATE MILLSITE	CY	14,000	$10.80	$150,000	$91,000	$30,000	$270,000
		OSB039	DAYROCK MINE	CY	11,000	$10.80	$120,000	$71,000	$24,000	$210,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	360,000	$10.80	$3,900,000	$2,300,000	$780,000	$7,000,000
		OSB061	BLACKCLOUD CK MILLSITE	CY	7,000	$10.80	$76,000	$45,000	$15,000	$140,000
					Totals for TCD# C08 . . .		**$6,700,000**	**$4,000,000**	**$1,300,000**	**$12,000,000**
					Totals for Upland Tailings . . .		*$8,300,000*	*$5,000,000*	*$1,300,000*	*$15,000,000*
Floodplain Waste Rock										
	C01	Excavation								
		OSB032	DULUTH MINE BLACKCLOUD CK	CY	20,000	$2.70	$54,000	$32,000	$0	$86,000
		OSB038	CALIFORNIA NO.4	CY	31,000	$2.70	$84,000	$50,000	$0	$130,000
		OSB082	MONARCH MINE BLACKCLOUD CK	CY	13,000	$2.70	$35,000	$21,000	$0	$56,000
					Totals for TCD# C01 . . .		**$170,000**	**$100,000**	**$0**	**$280,000**
	C08	Regional Repository								
		OSB032	DULUTH MINE BLACKCLOUD CK	CY	20,000	$10.80	$220,000	$130,000	$43,000	$390,000
		OSB038	CALIFORNIA NO.4	CY	31,000	$10.80	$330,000	$200,000	$67,000	$600,000
		OSB082	MONARCH MINE BLACKCLOUD CK	CY	13,000	$10.80	$140,000	$84,000	$28,000	$250,000
					Totals for TCD# C08 . . .		**$690,000**	**$410,000**	**$140,000**	**$1,200,000**

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
					Totals for Floodplain Waste Rock . . .		*$860,000*	*$520,000*	*$140,000*	*$1,500,000*
Upland Waste Rock										
	C01	Excavation								
		BUR052	LITTLE SUNSET MINE	CY	4,000	$2.70	$11,000	$6,500	$0	$17,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	690,000	$2.70	$1,900,000	$1,100,000	$0	$3,000,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	75,000	$2.70	$200,000	$120,000	$0	$320,000
		BUR056	TAMARACK ROCK DUMPS	CY	290,000	$2.70	$790,000	$470,000	$0	$1,300,000
		BUR170	TAMARACK 400 LEVEL	CY	11,000	$2.70	$30,000	$18,000	$0	$48,000
		OSB033	RUTH MINE	CY	16,000	$2.70	$43,000	$26,000	$0	$69,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	17,000	$2.70	$46,000	$28,000	$0	$73,000
		OSB115	OPTION MINE	CY	200	$2.70	$540	$320	$0	$860
		WAL006	NORTHSIDE MINE	CY	200	$2.70	$540	$320	$0	$860
					Totals for TCD# C01 . . .		**$3,000,000**	**$1,800,000**	**$0**	**$4,800,000**
	C02a	Regrade/Consolidate/Revegetate								
		BUR051	SUNSET MINE	AC	2	$56,000.00	$100,000	$61,000	$13,000	$170,000
		BUR057	TAMARACK NO.4	AC	1	$56,000.00	$51,000	$31,000	$6,400	$88,000
		BUR058	TAMARACK NO.3	AC	1	$56,000.00	$54,000	$33,000	$6,800	$94,000
		BUR059	TAMARACK NO.1 & NO.2 (CUSTER MINE)	AC	2	$56,000.00	$97,000	$58,000	$12,000	$170,000
		BUR060	SUCCESS NO.2	AC	2	$56,000.00	$120,000	$72,000	$15,000	$210,000
		BUR061	SUCCESS NO.1	AC	1	$56,000.00	$80,000	$48,000	$9,900	$140,000
		BUR062	SUCCESS MINE ADJACENT DISTURBANCE	AC	1	$56,000.00	$38,000	$23,000	$4,800	$66,000
		BUR077	LACLEDE MINE	AC	1	$56,000.00	$64,000	$38,000	$8,000	$110,000
		BUR081	GUELPH MINE	AC	1	$56,000.00	$34,000	$20,000	$4,300	$59,000
		BUR082	UNIDENTIFIED DISTURBANCE	AC	0	$56,000.00	$24,000	$14,000	$2,900	$41,000
		BUR083	AMBERGRIS MINE	AC	0	$56,000.00	$18,000	$11,000	$2,200	$31,000
		BUR084	HERCULES NO. 2 (NINEMILE)	AC	0	$56,000.00	$15,000	$9,100	$1,900	$26,000
		BUR196	INDUS CLAIM UNNAMED ADIT	AC	0	$56,000.00	$17,000	$10,000	$2,200	$30,000
		BUR197	MEDICO CLAIM UNNAMED ADIT	AC	0	$56,000.00	$26,000	$15,000	$3,200	$44,000
		BUR205	TAMARACK UNNAMED ADJACENT ROCK DUM	AC	1	$56,000.00	$36,000	$22,000	$4,600	$63,000
		OSB031	IDAHO GALENA PROSPECT	AC	1	$56,000.00	$31,000	$19,000	$3,900	$54,000
		OSB034	MCDONALD MINE	AC	0	$56,000.00	$17,000	$10,000	$2,100	$29,000
		OSB035	UNIDENTIFIED DISTURBANCE	AC	0	$56,000.00	$27,000	$16,000	$3,400	$47,000
		OSB036	UNIDENTIFIED DISTURBANCE	AC	0	$56,000.00	$14,000	$8,400	$1,800	$24,000

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		OSB037	UNNAMED ADIT	AC	1	$56,000.00	$40,000	$24,000	$5,000	$69,000
		OSB039	DAYROCK MINE	AC	12	$56,000.00	$660,000	$400,000	$82,000	$1,100,000
		OSB041	GALENA NO. 2	AC	1	$56,000.00	$46,000	$28,000	$5,700	$79,000
		OSB042	NINEMILE MINING COMPANY NO.2	AC	0	$56,000.00	$11,000	$6,400	$1,300	$18,000
		OSB043	MAYFLOWER NO.3	AC	1	$56,000.00	$75,000	$45,000	$9,400	$130,000
		OSB045	ALAMEDA PROSPECT	AC	1	$56,000.00	$47,000	$28,000	$5,900	$81,000
		OSB046	LANSING MINE (ALBION)	AC	0	$56,000.00	$20,000	$12,000	$2,500	$34,000
		OSB048	AMERICAN MINE	AC	0	$56,000.00	$8,400	$5,000	$1,100	$14,000
		OSB049	TREASURE VAULT	AC	1	$56,000.00	$31,000	$18,000	$3,900	$53,000
		OSB055	SILVER STAR MINE	AC	0	$56,000.00	$20,000	$12,000	$2,500	$35,000
		OSB081	NINEMILE MINING COMPANY NO.1	AC	0	$56,000.00	$7,800	$4,700	$980	$14,000
		OSB083	BLACKCLOUD NO.3	AC	1	$56,000.00	$43,000	$26,000	$5,400	$74,000
		OSB087	UNNAMED TUNNEL	AC	0	$56,000.00	$5,600	$3,400	$700	$9,700
		OSB114	UNNAMED ADIT	AC	0	$56,000.00	$12,000	$7,400	$1,500	$21,000
		OSB116	PANHANDLE MINE	AC	0	$56,000.00	$17,000	$10,000	$2,200	$30,000
		WAL069	SIERRA SILVER MINE	AC	0	$56,000.00	$13,000	$8,100	$1,700	$23,000
		WAL075	UNNAMED ADIT	AC	0	$56,000.00	$5,000	$3,000	$630	$8,700
		WAL078	UNNAMED ADIT	AC	0	$56,000.00	$15,000	$9,100	$1,900	$26,000
					Totals for TCD# C02a . . .		**$1,900,000**	**$1,200,000**	**$240,000**	**$3,300,000**
	C07	**Local Repository Above Flood Level**								
		BUR052	LITTLE SUNSET MINE	CY	4,000	$9.70	$39,000	$23,000	$8,700	$71,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	690,000	$9.70	$6,700,000	$4,000,000	$1,500,000	$12,000,000
					Totals for TCD# C07 . . .		**$6,800,000**	**$4,100,000**	**$1,500,000**	**$12,000,000**
	C08	**Regional Repository**								
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	75,000	$10.80	$810,000	$490,000	$160,000	$1,500,000
		BUR056	TAMARACK ROCK DUMPS	CY	290,000	$10.80	$3,200,000	$1,900,000	$630,000	$5,700,000
		BUR170	TAMARACK 400 LEVEL	CY	11,000	$10.80	$120,000	$71,000	$24,000	$210,000
		OSB033	RUTH MINE	CY	16,000	$10.80	$170,000	$100,000	$35,000	$310,000
		OSB044	SUCCESS MINE ROCK DUMP	CY	17,000	$10.80	$180,000	$110,000	$37,000	$330,000
		OSB115	OPTION MINE	CY	200	$10.80	$2,200	$1,300	$430	$3,900
		WAL006	NORTHSIDE MINE	CY	200	$10.80	$2,200	$1,300	$430	$3,900
					Totals for TCD# C08 . . .		**$4,500,000**	**$2,700,000**	**$890,000**	**$8,000,000**

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
					Totals for Upland Waste Rock . . .		*$16,000,000*	*$9,700,000*	*$2,700,000*	*$28,000,000*
Adit Drainage										
	C10	**Adit Drainage Collection**								
		BUR051	SUNSET MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR058	TAMARACK NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR081	GUELPH MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR170	TAMARACK 400 LEVEL	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		BUR171	TAMARACK NO.5	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB039	DAYROCK MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB055	SILVER STAR MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB088	ALAMEDA MINE	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
		OSB089	SUCCESS NO.3	LS	1	$6,200.00	$6,200	$3,700	$1,100	$11,000
					Totals for TCD# C10 . . .		**$68,000**	**$41,000**	**$12,000**	**$120,000**
	PT-1a	**Permeable Reactive Trench**								
		BUR051	SUNSET MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR053	INTERSTATE-CALLAHAN MINE/ROCK DUMPS	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR054	REX NO.2 / SIXTEEN-TO-ONE MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR058	TAMARACK NO.3	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR081	GUELPH MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR170	TAMARACK 400 LEVEL	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		BUR171	TAMARACK NO.5	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB039	DAYROCK MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB055	SILVER STAR MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
		OSB088	ALAMEDA MINE	CY	10	$440.00	$4,400	$2,600	$26,000	$33,000
					Totals for TCD# PT-1a . . .		**$44,000**	**$26,000**	**$260,000**	**$330,000**
	TRMT-1	**Media Filter Treatment Plant**								
		OSB089	SUCCESS NO.3	GPM	16	$1,850.00	$29,000	$22,000	$58,000	$110,000
					Totals for TCD# TRMT-1 . . .		**$29,000**	**$22,000**	**$58,000**	**$110,000**
					Totals for Adit Drainage . . .		*$140,000*	*$89,000*	*$330,000*	*$560,000*

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
General										
	ACC-1	**Temporary Access Road**								
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$200,000	$120,000	$0	$320,000
		ACCESSNM	Road construction required to access remote source area	MI	5	$200,000.00	$1,000,000	$600,000	$0	$1,600,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$200,000	$120,000	$0	$320,000
		ACCESSNM	Road construction required to access remote source area	MI	1	$200,000.00	$200,000	$120,000	$0	$320,000
					Totals for TCD# ACC-1 . . .		**$1,600,000**	**$960,000**	**$0**	**$2,600,000**
	HAUL-1	**Haul to Local Repository, 1/2 Mile One Way**								
		LHAULNM	Hauling to Local Repository	CY-MI	350,000	$0.89	$310,000	$190,000	$0	$500,000
					Totals for TCD# HAUL-1 . . .		**$310,000**	**$190,000**	**$0**	**$500,000**
	HAUL-2	**Haul to Regional Repository**								
		RHAULNM	Hauling to Regional Repository	CY-MI	70,000	$0.89	$62,000	$37,000	$0	$100,000
		RHAULNM	Hauling to Regional Repository	CY-MI	3,100,000	$0.89	$2,800,000	$1,700,000	$0	$4,500,000
		RHAULNM	Hauling to Regional Repository	CY-MI	390,000	$0.89	$350,000	$210,000	$0	$550,000
					Totals for TCD# HAUL-2 . . .		**$3,200,000**	**$1,900,000**	**$0**	**$5,100,000**
	PIPE-1	**Conveyance Pipeline-6"**								
		PIPENM02	Pipeline to Active Treatment	LF	8,200	$39.00	$320,000	$190,000	$24,000	$540,000
		PIPENM04	Pipeline to Active Treatment	LF	16,000	$39.00	$630,000	$380,000	$47,000	$1,100,000
					Totals for TCD# PIPE-1 . . .		**$950,000**	**$570,000**	**$71,000**	**$1,600,000**
					Totals for General . . .		*$6,100,000*	*$3,600,000*	*$71,000*	*$9,800,000*
Buildings & Structures										
	HH-4	**Demolition/Disposal of Buildings & Structures**								
		OSB039	DAYROCK MINE	CY	10,000	$120.00	$1,200,000	$720,000	$150,000	$2,100,000
					Totals for TCD# HH-4 . . .		**$1,200,000**	**$720,000**	**$150,000**	**$2,100,000**
					Totals for Buildings & Structures . . .		*$1,200,000*	*$720,000*	*$150,000*	*$2,100,000*
Bioengineering Actions										
	BSBR-AV	**Bank Stabilization via Revetments - Average Cost**								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$83.00	$330,000	$200,000	$100,000	$630,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$83.00	$630,000	$380,000	$190,000	$1,200,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$83.00	$170,000	$100,000	$52,000	$330,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$83.00	$60,000	$36,000	$18,000	$110,000

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Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$83.00	$460,000	$280,000	$140,000	$880,000
					Totals for TCD# BSBR-AVG . . .		$1,700,000	$990,000	$500,000	$3,100,000
	CD-AVG	Current Deflector Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	EA	40	$1,380.00	$55,000	$33,000	$17,000	$100,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	EA	76	$1,380.00	$100,000	$63,000	$31,000	$200,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	EA	37	$1,380.00	$51,000	$31,000	$15,000	$97,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	EA	21	$1,380.00	$29,000	$17,000	$8,700	$55,000
		NM04-2	Black Cloud Creek to Silver Star Mine	EA	7	$1,380.00	$9,700	$5,800	$2,900	$18,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	EA	56	$1,380.00	$77,000	$46,000	$23,000	$150,000
					Totals for TCD# CD-AVG . . .		$330,000	$200,000	$98,000	$620,000
	CH REAL	Channel Realignment								
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	28,000	$29.00	$800,000	$480,000	$140,000	$1,400,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SY	9,600	$29.00	$280,000	$170,000	$49,000	$490,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SY	74,000	$29.00	$2,100,000	$1,300,000	$380,000	$3,800,000
					Totals for TCD# CH REAL-1 . . .		$3,200,000	$1,900,000	$560,000	$5,700,000
	FP/RP-AV	Floodplain and Riparian Replanting - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	SF	200,000	$0.94	$190,000	$110,000	$33,000	$330,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SF	380,000	$0.94	$350,000	$210,000	$62,000	$630,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SF	460,000	$0.94	$440,000	$260,000	$76,000	$770,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SF	140,000	$0.94	$140,000	$82,000	$24,000	$240,000
		NM04-2	Black Cloud Creek to Silver Star Mine	SF	140,000	$0.94	$130,000	$81,000	$24,000	$240,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	SF	670,000	$0.94	$630,000	$380,000	$110,000	$1,100,000
					Totals for TCD# FP/RP-AVG . . .		$1,900,000	$1,100,000	$330,000	$3,300,000
	OFFCH-A	Off-Channel Hydrologic Feature Average Cost								
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	SY	370	$29.00	$11,000	$6,400	$1,900	$19,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	SY	1,300	$29.00	$38,000	$23,000	$6,700	$68,000
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	SY	2,400	$29.00	$69,000	$41,000	$12,000	$120,000
					Totals for TCD# OFFCH-AVG . . .		$120,000	$71,000	$21,000	$210,000
	VBS-AVG	Vegetative Bank Stabilization - Average Cost								
		NM01-1	Headwaters of East Fork Ninemile Creek to Interstate M	LF	4,000	$36.00	$140,000	$87,000	$43,000	$270,000
		NM02-1	Interstate Mill site on the East Fork to the mainstem Nin	LF	7,600	$36.00	$270,000	$160,000	$82,000	$520,000
		NM03-1	Headwaters of Ninemile Creek to confluence with the E	LF	4,600	$36.00	$170,000	$100,000	$50,000	$320,000

Table 8.2-7
Summary of Estimated Remedial Costs By Waste Type and Source - Alternative 4
Nine Mile Creek Watershed

Waste Type	TCD / RA	Source		Unit	Quantity	Unit Cost	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 Yr. NPV)	Total Cost
		NM04-1	Mainstem Ninemile Creek to Black Cloud Creek	LF	2,100	$36.00	$74,000	$45,000	$22,000	$140,000
		NM04-2	Black Cloud Creek to Silver Star Mine	LF	720	$36.00	$26,000	$15,000	$7,700	$49,000
		NM04-3	Silver Star Mine to South Fork Coeur d'Alene River	LF	5,600	$36.00	$200,000	$120,000	$60,000	$380,000
					Totals for TCD# VBS-AVG . . .		**$880,000**	**$530,000**	**$260,000**	**$1,700,000**
					Totals for Bioengineering Actions . . .		*$8,100,000*	*$4,800,000*	*$1,800,000*	*$15,000,000*
					Totals for Nine Mile Creek . . .		**$47,000,000**	**$28,000,000**	**$7,200,000**	**$82,000,000**

Table 8.2-8
Summary of Estimated Costs for Removal, Containment, and Treatment TCDs
Alternatives 2, 3, and 4

TCD	Description	Unit	Direct Capital Costs	Indirect Capital Costs	Annual O&M Costs
Removal and Containment TCDs					
C1	Excavation	CY	$2.70	$ 1.60	$ 0
C1a	Excavation Below Water Table	CY	$26.00	$ 16.00	$ 0
C1b	Sediment Excavation	CY	$10.00	$6.00	$0
C2a	Regrade/Consolidate/Revegetate	AC	$56,000	$34,000	$565
C2b	Regrade/Consolidate/Revegetate	AC	$110,000	$66,000	$1,100
C2c	Erosion Protection	AC	$11,000	$6,600	$200
C3	Low Permeability GCL Cap	AC	$151,000	$91,000	$1,500
C4	Low Permeability GCL Cap w/Seepage Coll & Trmt	AC	$170,000	$100,000	$3,100
C5	Low Permeability GCL Cap w/Erosion Protection	AC	$170,000	$100,000	$3,100
C6*	Local Repository w/Erosion Protection	CY	$10.40	$6.20	$0.19
C7*	Local Repository Above Flood Level	CY	$9.70	$5.80	$0.18
C8a*	Regional Repository, 1 million cy	CY	$13.10	$7.90	$0.24
C8b*	Regional Repository, 10 million cy	CY	$7.70	$4.60	$0.11
C8c*	Regional Repository, 50 million cy	CY	$6.20	$3.70	$0.07
C9	Tailings Impoundment Closure	AC	$170,000	$100,000	$2,700
C10	Adit Drainage Collection	LS	$6,200	$3,700	$88
C11	Hydraulic Isolation Using Slurry Wall	LF	$280	$168	$9
C12	Hydraulic Isolation Using Lined Channel	LF	$500	$300	$16.10
OTHER					
HAUL-1	Haul to Repository	CY-MI	$0.89	$0.53	$0
ACC-1	Temporary Access Road	MI	$200,000	$120,000	Assume road will not be maintained.
Active Treatment TCDs					
CONVEYANCE					
PIPE-1	Conveyance Pipeline-6"	LF	$39	$23.00	$0.24
PIPE-2	Conveyance Pipeline-12"	LF	$58	$35	$0.35
PIPE-3	Conveyance Pipeline-24"	LF	$94	$56	$0.57
PIPE-4	HDPE Conveyance Pipeline Cost Factor, $/dia- in.	DIA IN	$5.10	$3.10	$0.03
PRIMARY ACTIVE TREATMENT: HIGH DENSITY SLUDGE HYDROXIDE PRECIPITATION					
Variations with Media Filtration					
TRMT-1a	5,000 gpm	GPM	$2,180	$1,640	$352
TRMT-1b	45,000 gpm	GPM	$1,190	$893	$192
TRMT-2a	w/Sulfide Feed - 5,000 gpm	GPM	$2,270	$1,700	$366
TRMT-2b	w/Sulfide Feed - 45,000 gpm	GPM	$1,230	$923	$198
Variations with Microfiltration					
TRMT-3a	5,000 gpm	GPM	$3,550	$2,660	$573
TRMT-3b	45,000 gpm	GPM	$2,580	$1,940	$416
TRMT-4a	w/Sulfide Feed - 5,000 gpm	GPM	$3,650	$2740	$589
TRMT-4b	w/Sulfide Feed - 45,000 gpm	GPM	$2,620	$1970	$423

Table 8.2-8 (Continued)
Summary of Estimated Costs for Removal, Containment, and Treatment TCDs
Alternatives 2, 3, and 4

TCD	Description	Unit	Direct Capital Costs	Indirect Capital Costs	Annual O&M Costs
Passive and In-Situ Treatment TCDs					
PASSIVE TREATMENT					
PT-1a	Permeable Reactive Trench w/Apatite	CY	$440	$264	$213
PT-1b	Permeable Reactive Trench w/Organic Mixture	CY	$51	$31	$45
PT-2a	Permeable Reactive Bed w/Apatite	CY	$530	$318	$256
PT-2b	Permeable Reactive Bed w/Organic Mixture	CY	$53	$32	$47
PT-3	Aerobic Wetland	MSF	$2,700	$1,600	$436
PT-4	Anaerobic Wetland	MSF	$7,700	$4,600	$5,800
IN-SITU TREATMENT					
PT-5a	Shallow Soil Mixing	CY	$12	$7.20	$0.20
PT-5b	Deep Soil Mixing w/Deep Tiller	CY	$16	$9.60	$0.30
PT-5c	Deep Soil Mixing w/Excavator	CY	$22	$13	$0.40
PT-5d	Deep Soil Mixing w/Auger	CY	$52	$31	$1.10
PT-6a	Underwater Applied with Barge	MSF	$840	$504	$16.90
PT-6b	Underwater Applied with Spreader or Diffuser	MSF	$850	$510	$17
PT-6c	Underwater Applied w/ Spray Equipment from Shore	MSF	$820	$492	$16.50
Human Health TCDs					
HH1	Access Restrictions (Fence)	LF	$25	$15	$0.20
HH2	Upland Waste Pile Soil Cover	AC	$43,000	$26,000	$433
HH3	Millsite Decontamination	LS	$100,000	$60,000	$403
HH4	Millsite Demolition/Disposal	CY	$120	$72	$1.20

* Does not include haul costs

Notes:
AC - acre
CY - cubic yard
CY-MI - cubic yard - mile
DIA INCH - diameter inch
EA - each
GPM - gallons per minute
LF - linear foot
LS - lump sum
MI - mile
MSF - thousand square feet

Table 8.2-9
Summary of Estimated Bioengineering TCD Costs

Unit Price Code/TCD	Description	Unit	Direct Capital Costs	Indirect Capital Costs	Annual O&M Costs
Current Deflectors					
CD-1	Current Deflector-Groynes (Spur Dikes, Spurs)	EA	$1,330	$798	$31
CD-2	Current Deflector-Bank Deflector with Root Wad	EA	$1,160	$696	$28
CD-3	Current Deflector-Riprap Groynes	EA	$1,260	$756	$31
CD-4	Current Deflector-Log Weir & Dam Structure	EA	$1,850	$1,100	$45
CD-5	Current Deflector-Angled Vortex Rock Weir w/Rootwads	EA	$1,260	$756	$31
CD-6	Current Deflector-Riprap Turning Rock Wall	EA	$1,470	$882	$36
CD-7	Current Deflector-Riprap Tieback	EA	$1,350	$810	$33
CD-Avg	Current Deflector Average Cost	EA	$1,380	$828	$33
Vegetative Bank Stabilization					
VBS-1	Brush Mattress w/Rock Toe	LF	$37	$22	$0.90
VBS-2	Brush Layer	LF	$19	$11	$0.50
VBS-3	Live Stake, Live Post & Joint Planted Fascines	LF	$53	$32	$1.30
VBS-Avg	Category Average	LF	$36	$22	$0.88
Bank Stabilization Using Bioengineered Revetments					
BSBR-1	Vegetated Geogrid	LF	$75	$45	$1.90
BSBR-2	Live Cribwall	LF	$140	$84	$3.40
BSBR-3	Low Energy Tree Revetment	LF	$41	$25	$0.99
BSBR-4	Moderate Energy Tree Revetment	LF	$70	$42	$1.70
BSBR-5	Tree Deflector	LF	$62	$37	$1.50
BSBR-6	Woody Debris & Vegetated Geogrid System	LF	$110	$66	$2.70
BSRB-Avg	Category Average	LF	$80	$50	$1.90
Floodplain/Riparian Planting					
FP/RP-1	Floodplain/Riparian Planting	SF	$0.39	$0.20	$0.01
FP/RP-2	Floodplain Planting	SF	$1.49	$0.89	$0.02
FP/RP-Avg	Category Average	SF	$0.94	$0.56	$0.01
Off-Channel Hydrologic Features					
OFFCH-1	Groundwater-Fed Side Channel	SY	$17	$10	$0.20
OFFCH-2	Surface-Fed Side Channel	SY	$29	$17	$0.40
OFFCH-3	Off-Channel Pond	SY	$42	$25	$0.59
OFFCH-Avg	Category Average	SY	$29	$17	$0.40
Channel Realignment					
CH REAL-1	Channel Realignment	SY	$29	$17	$0.40

Table 8.2-9 (Continued)
Summary of Estimated Bioengineering TCD Costs

Notes:
EA - each
LF - linear foot
SF - square foot
SY - square yard

Table 8.2-10
Description of Alternative 5 (State of Idaho) TCDs and Estimated Unit Costs

DEQ Design	Action	Estimated Unit Costs*			Assumptions
		Direct Capital Costs	Indirect Costs	O&M Costs	
1	Excavate waste and dispose locally	$8.50/cy	$5.10	$0	Consists of $3.50/cy for excavation of dry materials and $5/cy for a 1-hr rt haul.
2	Excavate waste or soil and dispose in region landfill	$18.50/cy	$11	$0	Consists of $3.50/cy for excavation of dry materials and $15/cy for a 3-hr rt haul.
3	Excavate stream sediments or banks and dispose	$19.50/cy	$12	$0	Consists of $3.50/cy for excavation of wet materials and $15/cy for a 3-hr rt haul plus $1/cy for access improvements and dewatering or water controls.
4	General grading	$2/cy	$1.20	$0.02	Assumes regrade an average 3' depth over area.
5	Relocate	$6/cy	$3.60	$0.06	Consists of moving waste from drainages onto high ground, soil cover, rip-rap toe protection and stream stabilization.
6	Toe stabilization	$50 lf	$30	$0.91	Assumes rip-rap 10' up slope w/ 3' diameter rock.
7	Cap - general	$16.50/cy	$9.90	$0.17	Includes $15/cy delivered material and $1.50/cy for spreading and grading.
8	Cap - low permeability	$20.50/cy	$12	$0.21	Includes $18.50/cy delivered material and $2.50/cy for spreading, grading and compacting.
9	Cap - geocover system	$45,000	$27,000	$820	Consists of 6" subgrade @ $2/cy, geosynthetic liner @ $3/sy, 12" drain layer @ $6/cy, surface water control @ $0.25/sy, and soil and vegetation @ $11/cy.
10	Upland vegetation	$5,000/ac	$3,000	$50	Mechanical planting for erosion control.
11	Wetland vegetation	$11,000/ac	$6,600	$160	Hand/mechanical planting for stabilization, biofiltration and habitat.
12	Streamwork - Riprap	$13/lf	$7.80	$0.21	Assumes 3' up the slope or river bank if for erosion control. In-stream rock structures for habitat improvement.
13	Bioengineering streambanks	$40/lf	$24	$0.97	Includes a combination of plantings, soil wraps, root wads, matting, rip-rap, sills, barbs and other hydraulic features @ $30/lf plus streambank preparation @ $10/lf.
14	Excavate river bed, bank wedges and floodplain by barge	$50/cy	$30	$0.81	Consists of excavation from a barge @ $30/cy, dewatering and access improvements @ $2/cy and a three hours haul @ $18/cy. Wedges assumed as 1 cy/lf.
15	Bioengineering streambank wedge after excavation	$30/lf	$18	$0.73	Includes a combination of plantings, soil wraps, root wads, matting, rip-rap, sills, barbs and other hydraulic features. Assumes that excavation prepared banks.
16	Bioengineering streambank w/o excavation	$60/lf	$36	$1.50	Includes grading of banks @ $30/lf plus a combination of plantings, soil wraps, root wads, matting, rip-rap, sills, barbs and other hydraulic features @ $30/lf. Assumes difficult access or access by barge.
17	Adit Closure	$62,000	$37,000	$880	Includes gate or barrier and water collection and conveyance system.
18	Adit Water Treatment	$1,000,000	$600,000	$60,000	Unit cost is based upon bid specifications for the Success treatment project and scaled up to

Table 8.2-10 (continued)
Description of Alternative 5 (State of Idaho) TCDs and Estimated Unit Costs

DEQ Design	Action	Estimated Unit Costs[a]			Assumptions
		Direct Capital Costs	Indirect Costs	O&M Costs	
					a 1cfs adit discharge.
19	Groundwater Cutoff	$150/lf	$90	$4.80	Unit cost is EPA's estimate for LB-3C.
20	Soil Amendment	$20,000/ac	$12,000	$400	Unit cost is based upon EPA's estimate of $1,600/cy assuming mixing of the top one foot.
21	Subaqueous Capping/Treatment	$37,000/ac	$22,000	$750	Equivalent to EPA's $850/1000 sf. Capping material may include soil, biosolids, or chemical amendment
22	Mill Site Demolition	$250,000	$150,000	$2,500	Based upon Bunker Hill industrial complex demolition costs for buildings. Costs for minor structures such as crib walls are some fraction.
23	Repository Construction	$5.50/cy	$3.30	$0.10	Generally equivalent to EPA's C8a 1,000,000 cy repository but with only a single liner system and cover. DEQ includes a passive treatment to immobilize metals in leachate during dewatering. Hauling material to repository is included in DEQ excavation unit costs. Construction of access road included in DEQ infrastructure allowance.

[a] The State of Idaho was a source of the estimated costs.

Table 8.2-11
Alternative 6 (Mining Companies) TCDs and Estimated Unit Costs

TCD	Description	Direct Capital Unit Cost[a]	Indirect Cost[a]	Annual O&M Cost
PRP01	General Grading	$10,400/acre	$6,250	$100
PRP02	Slope Regrade	$10.30/cy	$6.20	$0.10
PRP03	Toe Pullback at Stream	$210/lf	$130	$2.10
PRP04	Capping	$67,000/acre	$40,000	$680
PRP05	Revegetation	$2,000/ acre	$1,200	$2
PRP06	Material Removal and Disposal at Repository	$18/cy	$10.80	$4.10
PRP07	Stream Cleanout/Disposal at Repository	$89/lf	$53	$20
PRP08	Stream Stabilization	$36/lf	$22	$0.73
PRP09	Adit Source Control	$1,100,000/ea	$660,000	$13,000
PRP10	Adit Discharge Drain Piping	$38/lf	$23	$0.23
PRP11	Block Access	$9,100/ea	$5,500	$130
PRP12	Treatment Wetland Construction	$3,900/gpm	$2,300	$240
PRP13	Riparian enhancement	$5/lf	$3	$0.12
PRP14	Bioengineering BMPs	$42/lf	$25	$1.00
PRP15	Tailings removal	$58/lf	$35	$1.40
PRP16	Streambank actions	$53/lf	$32	$1.30

[a] The mining companies were the source of estimated direct capital costs.

Table 8.2-12
Estimated Results of Alternative Implementation, South Fork at Pinehurst

Alternative	Zinc Concentration as a Multiple of AWQC at Completion of Implementation	Time to Achieve Zinc AWQC Relative to Alternative 4
1	9.8	3.0
2	6.7	2.4
3	3.2	1.5
4	2.3	1.0
5	8.5	2.7
6	8.9	2.8

Graph

9.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

9.1 HUMAN HEALTH ALTERNATIVES

For the human health alternatives, the comparative evaluations are presented in Tables 9.1-1 through 9.1-4, respectively, for soil, drinking water, house dust, and fish consumption alternatives. These tables summarize the various trade-offs between alternatives when compared to screening criteria.

9.2 ECOLOGICAL ALTERNATIVES

Some of the major tradeoffs between the ecological alternatives are related to the key technical issues identified for the site. Discussion of these tradeoffs, in the context of the nine CERCLA evaluation criteria, is included in Tables 9.2-1 (Upper and Lower Basin) and 9.2-2 (Spokane River).

- **Impacted sediments** are believed to be the major source of dissolved metals loading (especially zinc and cadmium) in the Upper Basin, and river bank and bed sediments the major source of metals loading (especially lead) due to erosion in the Lower Basin. 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 to the local communities and natural environment. Much of the sediment is not considered accessible due to its location beneath I-90 and other infrastructure. Other sediment is present beneath private property. Hydraulic isolation is a potential technical solution for dissolved metals loading, but it has potential adverse ecosystem impacts because it may limit the natural interchange of surface water and groundwater. Issues related to impacted sediments are discussed under the Overall Protection of Human Health and the Environment, Long-Term Effectiveness and Permanence, Short-Term Effectiveness, and Implementability criteria.

- **Time to achieve ARARs compliance**, especially AWQC, will be extended 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** for covering, bankfilling, 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 environmental impacts at off-site locations. Availability of materials is discussed under the Implementability criterion.

- **Repository siting**—there are limitations on the availability of suitable sites for large engineered repositories for disposal of excavated or dredged contaminated media. Repository siting is discussed under the Implementability criterion.

- **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 could add to long-term management costs, as would required long-term monitoring and periodic site reviews.

- **Socio-economic impacts**—remedy implementation would have short-term "quality of life" and potential economic impacts related to increased truck traffic, dust and noise generation, potential disruption of services and recreation opportunities, and reduced aesthetic quality. Socio-economic impacts are discussed under the Implementability criterion.

Table 9.1-1
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Recreational Areas					
Overall Protectiveness	No reduction in potential exposure and not protective.	Some reduction in exposure by behavior modification; unlikely to reduce blood lead concentrations to protective levels.	Increased reduction in exposure by restricting access to areas of high concentration; some exposure to other site areas would continue.	High reduction in exposure by restricting access and removing contaminated soil from other site areas; ongoing institutional control program would be needed.	Not applicable for recreational areas.
Compliance with ARARs	No decrease in lead concentrations to meet chemical-specific screening levels for lead and no reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some additional reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.	Not applicable for recreational areas.
Long-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Educational program assumed to continue for 15 years to maintain long-term effectiveness.	Maintenance of barriers assumed to continue for 30 years to maintain long-term effectiveness.	Ongoing maintenance for 30 years assumed necessary for long-term effectiveness because of potential recontamination. Maintenance period could be reduced if upstream sources of contamination are remediated.	Not applicable for recreational areas.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Some effectiveness shortly after program begins; no potential short-term adverse human health effects.	Effective shortly after barrier installation is complete; no potential short-term adverse human health effects.	Effective shortly after completion of soil removal and site improvements; dust suppression methods would need to be implemented during remedial action to minimize exposure to fugitive dust.	Not applicable for recreational areas.
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Easements, rights-of-way, and access agreements might be needed; time would be required to hire a contractor for maintenance and on-call repairs.	Similar requirements as for Alternative S3 plus additional time to establish repositories for contaminated soil and to complete soil removal.	Not applicable for recreational areas.

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Cost for 1,000 ppm Cleanup Level	$0	$243,000	$692,000	$2,018,000	Not applicable for recreational areas.
Residential Yards					
Overall Protectiveness	No reduction in potential exposure and not protective.	Some reduction in exposure by behavior modification; unlikely to reduce blood lead concentrations to protective levels.	Not applicable for residential yards.	Elimination of exposure by partial removal of contaminated soil and installation of barriers; ongoing institutional control program and monitoring would be needed.	Elimination of exposure by complete removal of contaminated soil; ongoing institutional control program would not be needed; monitoring might be needed.
Compliance with ARARs	No decrease in lead concentrations to meet chemical-specific screening levels for lead in residential soils and no reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	Not applicable for residential yards.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead in residential soils; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead in residential soils; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.
Long-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Educational program assumed to continue for 15 years to maintain long-term effectiveness.	Not applicable for residential yards.	Ongoing institutional controls program would continue for 60 years to maintain long-term effectiveness; monitoring would continue for 15 years as part of the educational program.	Institutional controls program would not be needed to maintain long-term effectiveness; monitoring might need to continue for 15 years because of potential for recontamination.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.	No treatment included.

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Residential Yard (Continued)					
Short-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Some effectiveness shortly after program begins; no potential short-term adverse human health effects.	Not applicable for residential yards.	Effective shortly after completion of soil removal and barrier installation; temporary relocation of residents, coordination with house dust remediation, and use of dust suppression methods would be implemented as necessary during remedial action to minimize exposure to fugitive dust.	Effective shortly after completion of soil removal; temporary relocation of residents, coordination with house dust remediation, and use of dust suppression methods would be implemented as necessary during remedial action to minimize exposure to fugitive dust.
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Not applicable for residential yards.	Extensive time would be required to meet with residents and arrange for soil removal, yard restoration, and temporary relocation as needed; ongoing contact would be required for the institutional controls program and monitoring; coordination with the house dust remediation program would be necessary.	Extensive time would be required to meet with residents and arrange for soil removal, yard restoration, and temporary relocation as needed; ongoing contact might be required for monitoring; coordination with the house dust remediation program would be necessary.
Cost for 500 ppm Cleanup Level	$0	$9,340,000	Not applicable for residential yards.	$91,757,000	$140,250,000
Cost for 700 ppm Cleanup Level	$0	$7,375,000	Not applicable for residential yards.	$70,287,000	$107,395,000
Cost for 1,000 ppm Cleanup Level	$0	$5,511,000	Not applicable for residential yards.	$49,928,000	$76,208,000

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Community soils					
Overall Protectiveness	No reduction in potential exposure and not protective.	Some reduction in exposure by behavior modification; unlikely to reduce blood lead concentrations to protective levels.	Increased reduction in exposure by installing fencing to restrict access to areas of high concentration; some exposure to soils in unfenced areas would continue.	High reduction in exposure by restricting access, partially removing contaminated soil, and installing barriers; ongoing institutional control program and monitoring would be needed.	Elimination of exposure by complete removal of contaminated soil; ongoing institutional control program would not be needed; monitoring might be needed.
Compliance with ARARs	No decrease in lead concentrations to meet chemical-specific screening levels for lead and no reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	No decrease in lead concentrations to meet chemical-specific screening levels for lead; some additional reduction in blood lead levels; no disturbance of soils would comply with location-specific and action-specific ARARs.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.	Lead concentrations would be reduced to meet chemical-specific screening levels for lead soils; significant reduction in blood lead levels; disturbance and removal of soils would require compliance with several location-specific and action-specific ARARs during remediation.
Long-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Educational program assumed to continue for 15 years to maintain long-term effectiveness.	Maintenance of fencing assumed to continue for 30 years to maintain long-term effectiveness.	Ongoing institutional controls program would continue for 60 years to maintain long-term effectiveness; monitoring would continue for 15 years as part of the educational program.	Institutional controls program would not be needed to maintain long-term effectiveness; monitoring might need to continue for 15 years because of potential for recontamination.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated soil and no effectiveness.	Some effectiveness shortly after program begins; no potential short-term adverse human health effects.	Effective shortly after fencing installation is complete; no potential short-term adverse human health effects.	Effective shortly after completion of soil removal and barrier installation; dust suppression methods would need to be implemented during remedial action to minimize exposure to fugitive dust.	Effective shortly after completion of soil removal; dust suppression methods would need to be implemented during remedial action to minimize exposure to fugitive dust.

Table 9.1-1 (Continued)
Comparative Evaluation of Human Health Alternatives for Soil

Criteria	Alternative S1 No Action	Alternative S2 Information and Intervention	Alternative S3 Access Modifications	Alternative S4 Partial Removal	Alternative S5 Complete Removal
Community soils (Continued)					
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Easements, rights-of-way, and access agreements might be needed; time would be required to hire a contractor for maintenance and on-call repairs.	Extensive time would be required to meet with property owners and arrange for soil removal and property restoration; ongoing contact would be needed for the institutional control program and monitoring.	Extensive time would be required to meet with property owners and arrange for soil removal and property restoration; ongoing contact might be needed for monitoring.
Cost for 1,000 ppm Cleanup Level	$0	$312,000	$2,212,000	$35,252,000	$52,437,000

Notes:
For residential properties, Alternatives S2, S4, and S5 include relocation, if necessary.
For recreational areas, Alternative S4 includes access modifications and site improvements, if necessary.
For residential areas, comparative evaluation is for 500, 700, and 1,000 ppm lead cleanup levels; the cleanup level for recreational and other areas is assumed to be 1,000 ppm lead.

Table 9.1-2
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W1 No Action	Alternative W2 Public Information, All Areas	Alternative W3 Residential Treatment, All Areas	Alternative W4 Public Water for Upper Basin (Inside Water District)	Alternative W4 Public Water for Upper Basin (Outside Water District)
Overall Protectiveness	No reduction in potential exposure and not protective.	Not expected to mitigate exposure pathway or reduce contaminant concentrations; unlikely to be protective.	Filters would be protective in areas with lead as the only contaminant; home reverse osmosis (HRO) units would be required to be protective in areas with arsenic or arsenic and lead as the contaminants.	Protective if public water districts comply with state and federal drinking water standards.	Protective if public water districts comply with state and federal drinking water standards.
Compliance with ARARs	No decrease in concentrations to meet MCLs.	No decrease in concentrations to meet MCLs.	Filters would meet MCLs in areas with lead as the only contaminant; HRO units would be required to meet MCLs in areas with arsenic or arsenic and lead as the contaminants.	Minor construction activities could require compliance with some action-specific ARARs; MCLs would be met.	Construction activities would require compliance with several action-specific ARARs; MCLs would be met.
Long-Term Effectiveness	No reduction in exposure to contaminated water and no effectiveness.	No reduction in exposure to contaminated water and no effectiveness; program assumed to continue for 60 years.	Monitoring and maintenance of filters and HRO units would need to continue for 30 years to maintain long-term effectiveness.	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No reduction of toxicity or volume; reduction in mobility using filtration/HRO units.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated water and no effectiveness.	No reduction in exposure to contaminated water and no effectiveness.	Effective shortly after filter/HRO unit installation is complete; no potential short-term adverse human health effects.	Additional connections could be provided rapidly if there is system capacity; effective shortly after completion of additional connections.	Distribution system study, and planning would delay implementation; effective shortly after completion of construction.
Implementability	Easily implemented; no action required.	Some time would be required to fund and hire staff for this program.	Some time would be required to meet with residents and arrange for installation, maintenance, and monitoring of filters/HRO units.	Systems would need to be reviewed to determine if there is capacity for additional connections.	Considerable time would be required to study, plan, design, and construct new systems; multiple pumping stations would be needed to provide systems in gulches.
Cost	$0	$428,000	$1,418,000	$129,000	$7,208,000

Table 9.1-2 (Continued)
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W4 Public Water for Lower Basin & Kingston (Inside Water District)	Alternative W4 Public Water for Lower Basin & Kingston (Outside Water District)	Alternative W5 Groundwater for Upper Basin (Inside Water District)	Alternative W5 Groundwater for Upper Basin (Outside Water District)
Overall Protectiveness	Protective if public water districts comply with state and federal drinking water standards.	Protective if public water districts comply with state and federal drinking water standards.	Protective in areas where suitable aquifers exist..	Protective in areas where suitable aquifers exist..
Compliance with ARARs	Minor construction activities could require compliance with some action-specific ARARs; MCLs would be met.	Construction activities would require compliance with several action-specific ARARs; MCLs would be met.	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.
Long-Term Effectiveness	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years	Long-term effectiveness would be dependent on reliability of public water districts; maintenance assumed to continue for 30 years	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	Additional connections could be provided rapidly if there is system capacity; effective shortly after completion of additional connections.	Distribution system study, and planning would delay implementation; effective shortly after completion of construction.	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.
Implementability	Systems would need to be reviewed to determine if there is capacity for additional connections.	Considerable time would be required to study, plan, design, and construct new systems; lengthy rural water mains could be required.	Difficult to implement in many areas of the Upper Basin because of a lack of suitable aquifers and because some areas have moratoriums on construction of new wells.	Difficult to implement in many areas of the Upper Basin because of a lack of suitable aquifers and because some areas have moratoriums on construction of new wells.
Cost	$688,000	$2,821,000	$152,000	$268,000

Table 9.1-2 (Continued)
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W5 Groundwater for Lower Basin and Kingston (Inside Water District)	Alternative W5 Groundwater for Lower Basin and Kingston (Outside Water District)	Alternative W6 Multiple Alternative Sources
Overall Protectiveness	Protective in areas where suitable aquifers exist..	Protective in areas where suitable aquifers exist..	In the Upper Basin, filters would provide protection if lead is the only contaminant; HRO units would be needed if arsenic or arsenic and lead are contaminants; connections to water districts would be protective if water districts comply with federal and state drinking water standards. In the Lower Basin, protection would be provided by installation of wells in suitable aquifers or by connection to water districts that comply with federal and state drinking water standards.
Compliance with ARARs	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.	MCLs would be met if suitable aquifers are available; monitoring would be required to confirm ongoing compliance.	Minor construction activities could require compliance with some action-specific ARARs; MCLs would be met.
Long-Term Effectiveness	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.	Long-term effectiveness could vary depending on subsurface conditions; monitoring would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; monitoring and maintenance assumed to continue for 30 years.	In the Upper Basin, long-term effectiveness would depend on monitoring and maintenance of filters and HRO units and on the reliability of public water districts for new connections. In the Lower Basin, long-term effectiveness of new wells could vary depending on subsurface conditions; monitoring of new wells would be required to confirm long-term effectiveness; implementation of a local wellhead protection plan would increase long-term effectiveness; long-term effectiveness of new connections to water systems would be dependent on the reliability of public water systems. Monitoring and maintenance assumed to continue for 30 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No reduction of toxicity or volume; reduction in mobility using filters and HRO units.
Short-Term Effectiveness	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.	Effective shortly after new wells become operational; providing interim bottled water could further increase short-term effectiveness; no potential short-term adverse human health effects.	For the Upper Basin, effective shortly after filters and HRO units are installed and after new connections to public water supplies are completed. For the Lower Basin, effective shortly after new wells become operational and after new connections to public water supplies are completed; providing interim bottled water could further increase short-term effectiveness while waiting for well installation. No potential short-term adverse human health effects.

Table 9.1-2 (Continued)
Comparative Evaluation of Human Health Alternatives for Water

Criteria	Alternative W5 Groundwater for Lower Basin and Kingston (Inside Water District)	Alternative W5 Groundwater for Lower Basin and Kingston (Outside Water District)	Alternative W6 Multiple Alternative Sources
Implementability	Difficult to implement in some areas of the Lower Basin because of a lack of suitable aquifers.	Difficult to implement in some areas of the Lower Basin because of a lack of suitable aquifers.	For the Upper Basin, some time would be required to meet with residents and arrange for installation, maintenance, and monitoring of filters/HRO units; water supply systems would need to be reviewed to determine if there is capacity for additional connections. For the Lower Basin, new wells might be difficult to implement in some areas because of a lack of suitable aquifers; water supply systems would need to be reviewed to determine if there is capacity for additional connections.
Cost	$1,245,000	$1,245,000	$2,210,000

Table 9.1-3
Comparative Evaluation of Human Health Alternatives for House Dust

Criteria	Alternative D1 No Action	Alternative D2 Information and Intervention and Vacuum Loan/Dust Mats	Alternative D3 Information and Intervention, Vacuum Loan/Dust Mats, Inferior Source Removal, and Capping/More Extensive Cleaning
Overall Protectiveness	No reduction in potential exposure and not protective.	Would reduce exposure and protect human health through education, awareness, and the availability of vacuums to remove contaminated house dust; degree of protectiveness dependent on efforts of individual counselors or nurses and the receptiveness of residents.	Would reduce exposure and protect human health by removing contaminated house dust from residences and by minimizing recontamination through education, awareness, and the use of loaned vacuums; degree of continued protectiveness dependent on efforts of individual counselors or nurses and the receptiveness of residents.
Compliance with ARARs	No decrease in concentrations to meet state or federal air quality standards.	Use of HEPA filters on vacuums and air monitoring should result in compliance with state and federal air quality standards.	Removing dust from homes followed by ongoing use of HEPA filters on vacuums and air monitoring should result in compliance with state and federal air quality standards; minor construction activities and disposal of some home furnishings will require compliance with some location-specific and action-specific ARARs.
Long-Term Effectiveness	No reduction in exposure to contaminated house dust and no effectiveness.	Long-term effectiveness will depend on residents participation in the vacuum loan and educational programs and on the quality and frequency of counseling and educational information provided; the program would continue for a period of 15 years.	Long-term effectiveness will be enhanced by cleaning interiors of residences after exterior cleanup is completed; long-term effectiveness will also depend on residents ongoing participation in the vacuum loan and educational programs and on the quality and frequency of counseling and educational information provided; cleaning of attics and basements and addition of caps to crawl spaces will increase long-term effectiveness by reducing exposure while these areas are being used by residents and reduce potential for these areas to be an additional source of contaminated house dust; ongoing monitoring and maintenance will be needed; the program would continue for a period of 15 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure to contaminated house dust and no effectiveness.	Effective in reducing dust concentrations in residences shortly after implementation; effectiveness in reducing blood lead levels could take several years; there would be no potential for short-term adverse human health effects.	Effective in reducing dust concentrations in residences shortly after implementation; effectiveness in reducing blood lead levels could take several years; workers would need to comply with standard safety procedures to minimize the potential for short-term adverse human health effects during interior cleaning, disposal of home furnishings, and capping of crawl spaces.
Implementability	Easily implemented; no action required.	Some time would be required to fund, hire staff, and purchase equipment for this program.	Some time would be required to fund, hire staff, and purchase equipment for the educational and vacuum loan/dust mat program; additional time would be required to hire and train qualified contractors for interior residential cleaning and other remedial activities.
Cost	$0	$1,390,000	$4,140,000

Table 9.1-4
Comparative Evaluation of Human Health Alternatives for Fish Consumption

Criteria	Alternative F1 No Action	Alternative F2 Information and Intervention	Alternative F3 Information and Intervention and Monitoring
Overall Protectiveness	No reduction in potential exposure and not protective.	Would reduce exposure and protect human health through education and awareness.	Would reduce exposure and protect human health through education and awareness; monitoring would provide location-specific information for the public.
Compliance with ARARs	There are no ARARs that specifically address the consumption of fish; no related ARARs would be considered.	There are no ARARs that specifically address the consumption of fish; federal and state surface water quality standards established to protect aquatic life would be considered to provide long-term protectiveness of fisheries resources in the Basin.	There are no ARARs that specifically address the consumption of fish; federal and state surface water quality standards established to protect aquatic life would be considered to provide long-term protectiveness of fisheries resources in the Basin.
Long-Term Effectiveness	No reduction in exposure from consumption of fish and no effectiveness.	Long-term effectiveness will depend on residents participation in educational programs and on the quality and frequency of educational information provided; the program would continue for a period of 15 years.	Long-term effectiveness will depend on residents participation in educational programs and on the quality and frequency of educational information provided; monitoring would permit focusing of the educational programs and provide a greater degree of long-term protectiveness; the program would continue for a period of 15 years.
Reduction of Toxicity, Mobility, Volume through Treatment	No treatment included.	No treatment included.	No treatment included.
Short-Term Effectiveness	No reduction in exposure from consumption of fish and no effectiveness.	Effective in reducing contaminated fish consumption shortly after implementation; there would be no potential for short-term adverse human health effects.	Effective in reducing contaminated fish consumption shortly after implementation; some time would be required for the results of monitoring to improve the effectiveness of the educational programs; there would be no potential for short-term adverse human health effects.
Implementability	Easily implemented; no action required.	Some components of this alternative have already been implemented in the Basin; some time would be required to fund and hire staff to expand this program.	Some components of the educational programs have already been implemented in the Basin; some time would be required to fund and hire staff to expand the educational program; additional time would be required to fund, plan, and implement a monitoring program..
Cost	$0	$230,000	$929,000

Table 9.2-1
Comparison of Ecological Alternatives Developed for the Upper and Lower Basins Using CERCLA Criteria

Criterion	Alternative 1 No Action	Alternative 2 Combined Stabilization/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	Not protective	Intermediate level of long-term effectiveness and time to achieve RAOs, including ARARs. Significant potential short-term impacts and implementability problems.	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.	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.	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.	Least protective of action alternatives.
Compliance with ARARs	Would not comply with ARARs within a reasonable timeframe	Intermediate time to achieve ARARs compliance. Estimated time to achieve compliance 140% longer than Alternative 4.	Second shortest time to achieve ARARs compliance. Estimated time to achieve compliance 50% longer than Alternative 4.	Shortest time to achieve ARARs compliance.	Second longest time to achieve ARARs compliance. Estimated time to achieve compliance 170% longer than Alternative 4.	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	Residual risk includes moderate potential for future erosion of impacted bed and bank sediments in Lower Basin. Continued loading from inaccessible sediments in Upper Basin. Estimated reduction of dissolved metals load in Upper Basin of 30%. Passive water treatment used, which is less reliable than active treatment. Effectiveness of soil treatment in Lower Basin is uncertain.	Residual risk includes limited potential for future erosion of impacted bed and bank sediments in Lower Basin. Estimated reduction of dissolved metals load in Upper Basin of 64%. Hydraulic isolation used to limit loading from inaccessible sediments in Upper Basin. Active water treatment used, which is more reliable than passive treatment. Relatively low potential for recontamination. Hydraulic isolation could have adverse ecosystem impacts.	Similar to Alternative 3, with some increase in effectiveness and permanence as a result of more widespread use of removal and disposal. Estimated reduction of dissolved metals load in Upper Basin of 73%.	Residual risks result from limited removal of bank wedges in Lower Basin, which could be remobilized by flooding or channel migration. Limited actions to address sediments and associated dissolved metals loads in Upper Basin. Estimated reduction of dissolved metals load in Upper Basin of 13%. Passive water treatment used, which is less reliable than active treatment. Effectiveness of soil treatment in Lower Basin is uncertain.	Highest residual risks among action alternatives, including least removal of bank wedges in Lower Basin, which could be remobilized by flooding or channel migration. Fewest actions to address sediments in Upper Basin. Estimated reduction of dissolved metals load in Upper Basin of 9%. Relies primarily on institutional controls to reduce waterfowl exposure to metals, and effectiveness is uncertain. Uses passive water treatment, which is less reliable than active treatment.
Reduction of Toxicity, Mobility, or Volume through Treatment		Substantial reduction of toxicity of drainage from major adits using passive treatment; no groundwater treatment	Reduction of toxicity using active treatment of groundwater and adits that are major loaders	Maximum reduction of water toxicity through treatment	Substantial reduction of toxicity of drainage from major adits using passive treatment; no groundwater treatment	Least reduction of toxicity through treatment.
Short-Term Effectiveness		Intermediate level of potential short-term water quality impacts. Moderate potential for short-term habitat loss. Intermediate implementation timeframe. Significant potential risks to community from increased truck traffic and dust generated by remedial activities. Intermediate level of overall short-term reduction of risk to ecological receptors.	Substantial potential for short-term water quality impacts, especially from riverbed dredging. Substantial potential for short-term loss of habitat in Lower Basin wetlands. High level of overall reduction of risk, but achieved only after a relatively long implementation period. Significant potential risks to community from increased truck traffic and dust generated by remedial activities.	Greatest potential for short-term water quality impacts, especially from riverbed dredging. Greatest potential for short-term loss of habitat resulting from widespread excavation of sediment in Lower Basin wetlands and floodplains. Highest level of overall reduction of risk, but achieved only after longest implementation period. Greatest potential risks to community from increased truck traffic and dust generated by remedial activities.	Relatively little potential for short-term water quality impacts. Moderate potential for short-term habitat loss. Relatively short implementation period. Relatively small risks to the community from remedy implementation. Intermediate level of overall short-term reduction of risk to ecological receptors.	Relatively little potential for short-term water quality impacts or habitat loss. Relatively short implementation period. Relatively small risks to the community from remedy implementation. Least overall short-term reduction of risk to ecological receptors.
Implementability		Potential concerns with availability of topsoil (or other growth media) and clean fill needed for revegetation of removal areas and repositories. Siting/permitting of repositories with 2.5 million cy capacity may be feasible. Potential problems with feasibility of sediment removals.	Limited availability of topsoil (or other growth media) and clean fill needed for revegetation of removal areas and repositories. Substantial siting/permitting problems associated with 26 million cy of repository capacity. Potential problems with feasibility of sediment removals and hydraulic isolation.	Greatest implementability problems related to availability of materials, technical feasibility, and siting/permitting of repositories with 67 million cy of capacity.	Relatively small materials requirements, siting/permitting of repositories with 1.4 million cy capacity should be feasible.	Least materials requirements, siting/permitting of repositories with 260,000 cy capacity should be feasible.
Cost		Total present worth cost = $370,000,000 Present worth O&M cost = $44,000,000	Total present worth cost = $1,300,000,000 Present worth O&M cost = $146,000,000	Total present worth cost = $2,500,000,000 Present worth O&M cost = $190,000,000	Total present worth cost = $257,000,000 Present worth O&M cost = $25,000,000	Total present worth cost = $194,000,000 Present worth O&M cost = $21,000,000
State Acceptance	To be completed following receipt of state comments on FS					
Community Acceptance	To be completed following receipt of public comments on FS					

Table 9.2-2
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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					
Controls used to reduce risks	No actions to reduce risk. Existing unacceptable risks to ecological receptors would remain unabated. Potential human health risks would remain unchanged.	Institutional controls would be used to limit potential human exposure and to control activities that may increase erosion of contaminants. Activities include postings, advisories, and vehicular access restrictions. Unacceptable risks to ecological receptors would continue for the foreseeable future. Human health risks may be reduced if individuals modify their behavior.	Limited removals and capping and containment would be used to reduce risks to human health. The actions taken to reduce risks to human health would significantly reduce ecological risks, as well. Beach material posing potential human health risks would be left in place and covered with a clean layer of imported beach material. In locations where riverine or riparian habitat may be adversely impacted by the grade changes created by a cover, beach materials would be excavated and backfilled with clean materials.	Excavation and disposal of beach and bank materials would be used to reduce potential human health and ecological risks. Only sediments posing potential human health risks and/or posing significant ecological risks that are located in critical habitat areas would be excavated and disposed of in a RCRA Subtitle D landfill. Capping of in-stream sediments exceeding PRGs would be used to minimize direct ecological exposure.	Extensive excavation of beach, bank, and in-stream sediments would be used to eliminate risks to human and most ecological receptors. Areas outside of critical habitat areas where sediment contaminant concentrations exceed PRGs would also be excavated. All materials would be disposed of in a RCRA Subtitle D landfill.
Effectiveness summary	Would not effectively reduce risks. Natural recovery processes may provide some limited long-term reduction in risk.	May be ineffective in reducing risks to humans. Calculated human health risks would remain the same. Would provide very limited reductions in the risk to ecological receptors by reducing erosion of contaminants. Natural recovery processes may provide some limited long-term reduction in risk.	Would effectively contain sediments posing risks to human health, and would effectively contain some but not all sediments posing risks to ecological receptors. Natural recovery processes may provide some additional long-term reduction in risk.	Removal and disposal of beach sediments would effectively reduce risks to human health and to ecological receptors in critical habitat areas. Capping would be effective in reducing ecological risks from in-stream sediments. Natural recovery processes may provide some additional long-term reduction in risk.	Removal and disposal would permanently remove all sediments posing significant human health and ecological risks. Natural recovery processes may further reduce residual risk
ARARs summary	Sediment ARARs would not be met for the foreseeable future.	Sediment ARARs would not be met for the foreseeable future.	Sediment ARARs would be met.	Sediment ARARs would be met.	Sediment ARARs would be met.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Compliance with ARARs					
Chemical-specific ARARs	Would not comply with chemical-specific ARARs for sediments, including the Washington State MTCA Method B values for the metals of concern.	See Alternative 1.	Would comply with chemical-specific ARARs for sediments, including the Washington State MTCA Method B values for the metals of concern.	See Alternative 3.	See Alternative 3.
Location-and action-specific ARARs	Not Applicable.	Not Applicable.	Would comply with all action-specific and location-specific ARARs, including substantive requirements of the Endangered Species Act, the Rivers and Harbors Act, Executive Order 11988 concerning work within a floodplain, the Washington State Shoreline Management Act, and the Washington State Hydraulic Projects Approval.	Would comply with all action-specific and location-specific ARARs, including substantive requirements of the Endangered Species Act, CWA §404 dredge and fill requirements, the Rivers and Harbors Act, Executive Order 11988 concerning work within a floodplain, the Washington State Shoreline Management Act, and the Washington State Hydraulic Projects Approval.	See Alternative 4.
Long-Term Effectiveness and Permanence					
Magnitude of residual risk	Magnitude of existing ecological risk and human health risk may decrease slightly due to natural recovery or remain essentially unchanged for several decades or longer.	High residual risk to ecological receptors. Some slight reductions would occur due to reductions in the erosion of contaminated sediments and through natural recovery. Potentially significant residual risk to human receptors. Postings, advisories, and vehicular access restrictions would have limited effectiveness.	Moderate residual risks to ecological receptors. Some contaminated sediments in critical habitat areas would not be remediated, and would pose a risk to ecological receptors. Natural recovery processes may further reduce residual risks in unremediated areas. Low residual risks to humans. Containment of contaminated sediments in excess of human health PRGs would be effective.	Low residual risks to ecological receptors. All contaminated sediments in critical habitat areas would be remediated, and would no longer pose a threat to ecological receptors. Natural recovery processes may further reduce residual risks in unremediated areas. Low residual risks to humans.	Very low residual risks to ecological receptors. All contaminated sediments above PRGs would be remediated, except for in-stream sediments in free-flowing portions of the upper Spokane River. Very low residual risks to humans.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Long-Term Effectiveness and Permanence (Continued)					
Adequacy and reliability of controls	No controls would be placed to control residual risks.	Remedy could effectively be maintained through inspections and replacement of damaged signs or vehicle barriers. Minimal maintenance requirements for the institutional controls.	Remedy could effectively be maintained through monitoring, maintenance, and institutional controls. Moderate maintenance requirements for caps and vegetated bank stabilization. Potential need for additional actions in the future due to recontamination of remediated areas as a result of transport of contaminants from upstream source areas.	Remedy could effectively be maintained through monitoring, maintenance, and institutional controls. Moderate maintenance requirements for in-stream cap. Potential need for additional actions in the future due to recontamination of remediated areas as a result of transport of contaminants from upstream source areas.	No long-term maintenance requirements, because contaminated sediments removed from site. Potential need for additional actions in the future due to recontamination of remediated areas as a result of transport of contaminants from upstream source areas.
Reduction of Toxicity, Mobility, or Volume through Treatment					
Treatment processes used	None.	None.	None.	None.	None.
Amount treated or destroyed	None.	None.	None.	None.	None.
Reduction in toxicity, mobility, or volume	None.	None.	None.	None.	None.
Irreversible treatment	None.	None.	None.	None.	None.
Type and quantity of residuals	None.	None.	None.	None.	None.
Statutory preference for treatment	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.	Satisfies because no principle threat wastes.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Short-Term Effectiveness					
Community protection	No additional short-term risks to community	No additional short-term risks to community	Limited short-term risks to community from construction traffic (2,000 truck trips). Risks minimized by traffic control plans.	Limited short-term risks to community from construction traffic (14,00 truck trips). Risks minimized by traffic control plans.	Limited short-term risks to community from construction traffic (44,000 truck trips). Risks minimized by traffic control plans.
Worker protection	No additional short-term risks to workers	No significant short-term risks to the workers due to the very limited construction activities.	Limited risks to workers from remediation actions. Risk would be minimized with standard health and safety measures.	Limited risks to workers from remediation actions. Risk would be minimized with standard health and safety measures. Significantly greater scope of actions would increase overall risk of worker injury.	Limited risks to workers from remediation actions. Risk would be minimized with standard health and safety measures. Greatest scope of actions would increase overall risk of worker injury.
Environmental impacts	No additional short-term risks to environment	No significant short-term risks to the environment due to the very limited construction activities.	Limited short-term impacts to the environment due to construction within the floodplain and riparian areas. These impacts are associated with: • Vegetated bank stabilization of 400 linear feet of embankment • Capping or excavating of 6.1 acres in the floodplain. Impacts will include an increase in sediment loads to the river during construction. These loads would be minimized or controlled through engineering controls.	Significant short-term impacts to the environment due to construction within the floodplain/ riparian areas and the Spokane River. These impacts are associated with: • Excavating 8.6 acres in the floodplain • Capping of in-stream sediments. Impacts will include an increase in sediment loads to the river during the excavation of floodplain/riparian areas, and re-mobilization of contaminated sediments during in-stream cap placement. These loads would be minimized or controlled through engineering controls.	Significant short-term impacts to the environment due to construction within the floodplain/ riparian areas and the Spokane River. These impacts are associated with: • Excavating 110 acres in the floodplain • Dredging and dewatering in-stream sediments. Impacts will include an increase in sediment loads to the river during the excavation of floodplain/riparian areas, re-mobilization of contaminated sediments during dredging, and water quality impacts due to discharge of water from the dewatering process. These impacts would be minimized or controlled through engineering controls and potentially water treatment.
Time until action is complete	Ineffective in reducing risks in the short-term. RAOs would not be achieved for the foreseeable future.	Would take approximately 1 month to implement. RAOs would not be achieved for the foreseeable future.	Would take approximately 6 months to implement. As construction is completed at individual sites, RAOs for sediments could be achieved immediately for these sites. RAOs would not be achieved in areas not being remediated for many years or decades.	Would take approximately 1 to 2 years to implement. As construction is completed at individual sites, RAOs for sediments could be achieved immediately for these sites. RAOs would not be achieved in areas not being remediated for many years or decades.	Would take approximately 2 to 3 years to implement and achieve RAOs.

Table 9.2-2 (Continued)
Comparison of CSM Unit 5 Cleanup Alternatives to Criteria

Criteria	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
Implementability					
Technical feasibility	Not applicable.	Technically feasible. No difficulties are anticipated during implementation of this alternative. Monitoring the effectiveness of this alternative in reducing exposures may be difficult.	Technically feasible. The primary difficulty associated with this alternative is access to the riverbanks. Monitoring can effectively measure the success of achieving RAOs.	Technically feasible. Some uncertainties in construction volumes. The primary difficulty associated with this alternative is access to the riverbanks and availability of staging areas for remediation of in-stream sediments. Monitoring can effectively measure the success of achieving RAOs.	Technically feasible. Significant uncertainties in construction volumes. Access to the riverbanks and availability of staging areas for remediation of in-stream sediments may be major concerns and could potentially increase costs. Monitoring can effectively measure the success of achieving RAOs.
Administrative feasibility	No significant administrative feasibility concerns.	No significant administrative feasibility concerns.	No significant administrative feasibility concerns. Coordination with other agencies required, potentially including completion of a biological assessment.	No significant administrative feasibility concerns. Coordination with other agencies required, potentially including completion of a biological assessment.	No significant administrative feasibility concerns. Coordination with other agencies required, potentially including completion of a biological assessment.
Availability of services and materials	Not applicable.	Not applicable.	Services, equipment, and technologies are all readily available.	Services, equipment, and technologies are all readily available.	Services, equipment, and technologies are all readily available. Potentially limited capacity at local landfill may necessitate longer transport distances.
Costs					
Capital	$0	$6,400	$920,000	$5,200,000	$26,000,000
30-Year O&M [a]	$0	$420,000	$460,000	$840,000	$820,000
Total present worth[b]	$0	$430,000	$1,400,000	$6,000,000	$27,000,000

[a]Operation and maintenance costs over 30 years in current dollars, assuming a 7% discount factor

[b]Total present worth cost equals the total equivalent cost of the alternative over 30 years in current dollars, assuming a 7% discount factor.

Notes:

ARARs - applicable or relevant and appropriate requirements
CY - cubic yards
LF - linear feet
RAO - remedial action objectives

10.0 PREFERRED ALTERNATIVE

The preferred alternative, based on cost effectiveness, is Alternative 3 for the Upper Basin and Lower Basin, Alternative 2 for Coeur d'Alene Lake, and Alternative 4 for the Spokane River. However, as stated previously, EPA is working in cooperation with the governments (including the states of Idaho and Washington and the Coeur d'Alene and Spokane Tribes) to develop a phased preferred alternative to cleanup contamination in the Basin.

For protection of human health, a wealth of information from the implementation of the remedy in the Bunker Hill Box was used when evaluating the range of cleanup alternatives. Based on this evaluation, the governments have general agreement on the proposed remedy for protection of human health in the communities of the Upper Basin, which includes areas upstream of the confluence of the North and South Forks of the Coeur d'Alene River. The governments are continuing discussions to identify appropriate solutions to resolve human health issues in the Lower Basin.

Given the size of Operable Unit 4, it is difficult to support a short-duration comprehensive remedy for the protection of ecological life in the Basin. In preparing the ecological Feasibility Study (FS) alternatives, EPA assembled and evaluated a range of comprehensive alternatives designed to achieve compliance with regulations and long-term protection of the environment to the extent possible. Also, as the alternatives included assumptions of source contribution and effectiveness of remedial actions for areas that are not yet well understood in the Basin, a phased approach would allow for a learn-as-you-go or "adaptive management" approach to Basin remediation, which should result in significant efficiencies over time.

10.1 HUMAN HEALTH PROTECTION

The preferred alternative for protection of human health is summarized in Table 10.1-1.

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 Basin. Potential lesser exposures are from lead in fish from the Lower Lakes and arsenic in shallow drinking water wells in the side gulches of the Upper Basin.

The risk assessment also identified potential 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 water potatoes and other cultural

plants throughout the wetlands, and eating large amounts of fish. The State of Washington is very concerned about the risks that exist to recreational users along the Spokane River. These exposures include contaminated beaches and fish consumption. Exposures at developed recreation areas in the Coeur d'Alene River Basin are addressed in the human health alternatives discussed in this section. Exposures at undeveloped recreation areas in the Coeur d'Alene River Basin and along the Spokane River are addressed as part of the ecological alternatives, which are described in Section 10.2.

10.1.1 Soil, House Dust, and Intervention Programs

The ultimate remedy for childhood exposure to lead is prevention. The importance of prevention of lead exposure has been highlighted by recent studies indicating adverse health effects at blood lead levels below 10 µg/dL and the failure of chelation treatment to prevent cognitive impairments in treated children (Lanphear et al. 2000; Rogan et al. 2001; Rosen and Mushak 2001). Actions include source removal and containment as well as public information and intervention. The proposed soil cleanup level is 1000 ppm lead for removal and capping of residential yards and common use areas. Soil with lead concentrations between 700 ppm and 1000 ppm would require a barrier such as vegetation, to prevent exposure and distribution of dust. Yard soil with lead concentrations greater than 1000 ppm will be removed to a depth of one foot (two feet in garden areas) and backfilled with clean soils and/or capped.

For those commercial properties within the site where access cannot be controlled, soil will be removed and replaced if soil concentrations exceed 1000 ppm lead, unless access and recontamination pathways can be otherwise controlled. This is necessary due to the linkage between community wide dust concentrations from all properties and recontamination, as well as childhood blood lead levels (HHRA, 2001, Five Year Review, 2000). Geographically, the valley is quite narrow in most places and this is likely the reason that young children often have limited places to play, and when not at their home are often found on commercial properties, providing direct exposure routes. Also, it has been shown that levels of community wide dust are correlated with individual house dust levels, which is likely why blood leads have been found to drop as community wide (not just on residential properties) levels of lead in dust falls over time.

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 with a foot of clean soil. Excavation of soils in recreational areas may also be used, as appropriate. The State of Washington firmly believes the preferred alternative should include the cleanup of Spokane River beach areas. Suitable barriers to exposure of lead contaminated soil and dust in common use areas such as streets, alleys, rights-of-ways, mine and mill sites, and playgrounds include removal, capping and vegetation.

It is expected that removal of one foot of contaminated soil and replacement with clean soil would go a long way to reducing lead concentrations inside each home, in addition to regular

cleaning and carpet replacement (disposal of carpets would be assisted by an institutional controls program, much like that in the smelter area). Young children are primarily exposed to lead in dust on the floors of their home (Manton et al. 2000; Succop et al. 1998; CDC 1991; Lanphear et al. 1998). Lead in house dust reflects contaminated soil from the yard, neighborhood and surrounding community (TerraGraphics 1999). Contaminated yard soil removal has been shown to be effective in reducing house dust concentrations in the smelter area for a large number of homes; this house dust concentration reduction co-occurred with a substantial drop in blood lead levels in children (Populated Areas Five Year Review, EPA, 2000). For the limited number of homes which continue to have a reservoir of high concentration of lead dust, a contingency is necessary (FS option D3 which includes cleaning, if necessary) to allow for assessment of these homes to determine if additional action is necessary should lead loading rates and/or concentrations exceed the prescribed criteria. The assessment would determine if rigorous cleaning of the home is necessary, if paint abatement of the home is necessary (to be conducted by a separate state run abatement program), or if both are necessary, with paint abatement preceding house cleaning to minimize recontamination. Costs of abatement of these homes are based on the Smelterville house cleaning pilot study (Terragraphics 2001) and are expected to decrease, should a lower level of cleaning considered in the study prove to be effective, and also by virtue of the economy of scale of cleaning a larger number of homes that were dealt with in the pilot.

Relocation is proposed as a last resort for homes which have contamination above action levels, but which have extensive recontamination potential, or for which adequate cleanup will be extremely difficult. An example where this may be applied is for homes in Cataldo within the floodplain where an existing relocation effort is underway. For the vast majority of homes which fall above the action level, every effort will be made to find a way in which the preferred soil alternative is effective in the long term.

In the interim before sources of lead exposure are adequately controlled, 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 will be available.

10.1.2 Drinking Water

To reduce current exposure from metals in drinking water, an alternative water supply would be provided to residences or areas where the existing water supply contains metals at concentrations greater than the maximum contaminant levels (MCLs). Residences with affected private wells within water districts would be connected to the existing public water supply system. For residences outside water districts (mostly in the tributary gulches), the alternative water supply would most likely consist of point-of-use treatment or new groundwater wells installed into a

suitable aquifer. A preferred alternative for protection of potential future drinking water supplies is not addressed at this time due to limitations in the RI.

10.1.3 Fish Consumption

The potential for lead exposure through fish consumption would be managed through educational resources available to fishermen and other recreational users about the potential health risk of consuming contaminated fish caught from lateral lakes and health advisories for subsistence fishing. A fish consumption advisory already exists in the Lower Basin and along part of the Spokane River. Decreases 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.

10.2 ECOLOGICAL PROTECTION

The preferred alternative for ecological protection in the Upper Basin and Lower Basin is Alternative 3. Three priority issues have been identified as an initial primary focus with respect to ecological protection.

- **Dissolved metals (particularly zinc and cadmium) in rivers and streams.** These metals have harmful effects on aquatic receptors, including fish. Approximately 20 miles of the South Fork and 10 miles of tributaries are unable to sustain reproducing fish populations. Species density and diversity are reduced throughout the Basin, and 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 ESA. The ambient water quality criteria for zinc and cadmium are exceeded throughout the Coeur d'Alene River system downstream of mining impacts, in Coeur d'Alene Lake, and in the Spokane River.

- **Lead in wetlands and floodplains.** Existing lead contamination has harmful effects on waterfowl and plants. Waterfowl mortalities due to lead poisoning associated with the ingestion of contaminated sediments have been reported for decades. The total number of waterfowl dying of lead poisoning has not been estimated, however, 682 dead or sick birds were found in the Basin between 1992 and 1997. The number of waterfowl carcasses found in 1997 represented the largest documented die-off in the Coeur d'Alene River Basin since 1953. 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 at reference sites nationally.

- **Particulate lead in the surface water**. Lead transported downstream in the river system is a continuing source of contamination to 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 warning 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 habitat areas cleaned up as part of the remedy.

In addition to ecological protection, the actions described in the following sections would have significant human health benefits for sensitive populations, including children. 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.

Sensitive populations potentially include low-income families, whose options for recreation, diet, and housing may be limited, or families who recreate frequently on the river by choice. These sensitive populations may have relatively high cumulative exposures to metals, particularly lead, compared to other population groups. These higher metals exposures may result from relatively high use of streambanks and beaches for recreation, fishing for recreation and diet, homegrown and wild vegetables for diet, and lead in house paint and water piping. For these sensitive populations, the reduction of incremental risk achieved by remediating contaminated streambank and beach sediments at recreation areas could have important health benefits.

Sensitive populations could also include individuals who would choose to practice a subsistence lifestyle. Currently, tribal member and others cannot safely practice a subsistence lifestyle due to the presence of contamination. Individuals practicing a subsistence lifestyle would consume much larger quantities of food derived from the Basin and potentially impacted by metals, including fish and water potatoes. The estimated consumption rates of fish and water potatoes by adults practicing a traditional subsistence lifestyle are 540 grams per day and 574 grams per day, respectively[4]. The water potato, a critical tribal resource, grows in submerged sediments, therefore, harvested water potato may have significant quantities of attached sediment, which could subsequently be ingested. In addition, a subsistence lifestyle would potentially include ingestion of untreated surface water.

[4] Subsistence lifestyles typically include ingestion of whole fish, including organs and bones that typically contain higher levels of metals than muscle tissue (filets).

10.2.1 Dissolved Metals in Rivers and Streams

High levels of dissolved metals, particularly zinc and cadmium, exist in the river system in the Basin. The dissolved metals concentrations and impacts from mining currently prevent the river system from fully supporting aquatic receptors, including native fish. The widespread occurrence of the tailings-impacted sediments, however, will make it difficult to reduce dissolved metals throughout the entire Basin to concentrations that fully support some sensitive native fish species in any reasonably short timeframe. It is not expected that this could be achieved throughout the Basin within a single lifetime using a practical cleanup scenario. However, further improvements to the ecosystem can begin in the short term and continue for many decades by combining remedial actions with natural recovery. In addition, some portions of the impacted areas can likely be returned to levels that will greatly improve the ecosystem locally.

In the shorter term, it is possible to achieve reductions of dissolved metals to concentrations that allow substantial improvement to the fisheries in selected stream segments and to the ecosystem of the upstream reaches of the South Fork and some of its tributaries. Fish and aquatic organisms that are more tolerant of metals than the 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.

Priority areas for the initial phase of remedy implementation will be selected based upon public input. However, those reaches where the most load reduction can be practically achieved and where the best chances exist for re-establishing a sustainable trout fishery, would be of particular interest. Table 10.2-1 identifies candidate interim benchmarks and associated costs for reducing dissolved metals in streams and improving fisheries in upstream areas of the Upper Basin.

One candidate interim benchmark for Ninemile Creek could be to provide conditions that would allow natural re-establishment of an adult fishery. An adult fishery would not necessarily include the presence of metals-sensitive species, reproduction, or juveniles. It is expected that an extended period of natural recovery would be needed to achieve conditions compatible with a fully-functional fishery in Ninemile Creek. The metals concentrations compatible with an adult fishery are under evaluation. Preliminary evaluations of reference areas where adult trout fisheries exist suggest that zinc concentrations would need to be reduced to about 4 to 7 times the AWQC. Currently, Ninemile Creek is essentially devoid of fish downstream of the area of mining impacts. Based on current concentrations of metals in Ninemile Creek and the expected reductions in metals loading that would result from remedial actions, it is anticipated that a relatively comprehensive level of cleanup would be required to achieve metals concentrations compatible with an adult fishery in Ninemile Creek. While return of an adult fishery is a candidate interim benchmark for Ninemile Creek, the remediation goals for Ninemile Creek are the RAOs listed in Table 7.2-1.

One candidate interim benchmark for Pine Creek could be to provide conditions that would allow natural re-establishment of a fully functional trout fishery. The parameters that define a fully functional fishery include total population, species diversity (including the presence of relatively metals-sensitive native species), and reproduction. The metals concentrations compatible with a fully functional fishery are expected to be approximately equal to the AWQC. Currently, Pine Creek supports an adult fishery downstream of the area of area of mining impacts, including brook trout and cutthroat trout. Based on current concentrations of metals in Pine Creek and the expected reductions in metals loading that would result from remedial actions, it is anticipated that a relatively comprehensive level of cleanup would be required to achieve metals concentrations compatible with a fully functional fishery in Pine Creek.

The overall effects of implementing the first increment of the remedy on metals loads in the river system are shown in Table 10.2-2. For an increment that includes comprehensive cleanup of Pine Creek and Ninemile Creek and implementation of upgraded water treatment of the Bunker Hill mine water, reductions of zinc loads of about 15 percent in the South Fork at Pinehurst and 12 percent in the Coeur d'Alene River at Harrison are estimated.

10.2.2 Lead in Floodplains and Wetlands

Sediments throughout the floodplains of the lower Coeur d'Alene 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.

The long-term goal is to reduce metal exposure of plants, wildlife, and fish throughout these areas to levels that are fully 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 the ecosystem locally. For example, one interim benchmark is the reduction of waterfowl mortality. Resource agencies have identified high-priority areas in the lower basin based on high waterfowl use and high levels of lead in sediments, including the wetlands surrounding Thompson Lake and the area known as Strobl Marsh. Figure 10.2-1 shows the rank order of average lead concentration in sediment and average feeding density at various areas within the Lower Basin, including Thompson Lake and Strobl Marsh.

A combination approach is envisioned for these areas. Contaminated materials would be excavated from some areas and transported to a repository or a local area within the lateral lakes for consolidation. Other areas would be capped with a layer of clean soil to prevent feeding birds from becoming exposed to metals. If feasible, capping materials would be obtained from

sources within the wetland unit, with the possibility of creating new ponds to increase diversity of habitat 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 initial phases of cleanup would include remediation of Thompson Lake and Strobl Marsh. Based on the numbers of waterfowl that feed at these areas as a percentage of the total numbers of waterfowl feeding in the Lower Basin, a mortality reduction of at least 17 percent is anticipated. The actual reduction in mortalities could be higher because the concentrations of lead in sediments at these areas, and therefore the lead exposure, is high relative to other feeding areas.

Hydraulic controls (floodgates) and levees may also be required to prevent recontamination of treated areas. The need for these types of structures would be evaluated during remedial design. Once these areas have been cleaned up, other contaminated wetland units would then be addressed.

An important goal is full return of cultural resources and recreational uses in the Basin. To reduce exposures associated with these uses, all remedies that address wetland risks to waterfowl would contain habitat enhancement components that enhance water potato grounds as well as recreational beaches. The use of warning signage in the Lower Basin is not preferred as the long-term solution.

10.2.3 Particulate Lead in Surface Water

Lead in surface water is transported downstream to Coeur d'Alene Lake and the Spokane River, and may wash across and contaminate the floodplain during flood events. Two sources are suspected to contribute the major lead load in the Lower Basin: contaminated riverbank materials and sediments in the riverbed. The riverbanks in many areas of the Lower Basin are steep and actively eroding into the river, primarily due to boat wakes. Riverbed sediments have become contaminated from materials transported from upstream and from the eroding riverbanks. This sediment is likely to be entrained during flood events and transported out of the river channel into the floodplain, where it is deposited.

The 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 prevent recontamination of cleaned-up areas and the occasional exceedances of drinking water standards in Coeur d'Alene Lake and to protect wildlife from exposure.

For the initial phases of remediation, cleanup actions will focus on areas containing actively eroding riverbanks. The reaches for bank stabilization will be prioritized on the degree of erosion occurring and the concentrations of metals in the riverbank sediments. Remedial actions will include a combination of bioengineering and removals as necessary to create a sustainable

river ecosystem. The extent of removal of contaminated material will be determined by the concentrations of metals in the river bank material, the likelihood that stabilized banks will remain stable into the future, site accessibility, and the presence of infrastructure.

A preliminary estimate of the reduction in particulate lead load that may be achieved through a combination of bioengineering and bank wedge removals is about 14,000 kilograms per year.[5] This reduction represents about 10 percent of the estimated average total load of 130,000 kg per year of particulate lead that enters the river between Cataldo and Harrison as a result of bed and bank erosion. The estimates of load reduction and estimated average total load are subject to a considerable degree of uncertainty, and the actual load reduction achieved could be a larger percentage of the total load.

Although the overall reduction of lead load would be limited, there are compelling reasons to include bank stabilization as an initial action. The actively eroding riverbanks can be accessed relatively easily, and bank removals and stabilization should be relatively cost effective. Further, bank stabilization should be conducted prior to cleanup actions in downstream riverbed and floodplain areas to minimize recontamination.

A challenge of removal is to find a repository location in the Lower Basin for the excavated materials. Sediment traps to catch material transported from upstream may be effective in the Lower Basin but more study is required to evaluate these structures. Because of the unknowns associated with the long-term behavior of the riverbed sediments and the potential for recontamination from upstream, remediation of riverbed sediments is not considered to be a high priority at that this time. Further study may indicate that removals of riverbed sediments are warranted in certain areas to prevent recontamination and to provide protection of human health and the environment.

10.3 COEUR D'ALENE LAKE

The preferred alternative for Coeur d'Alene Lake is Alternative 2. The preferred alternative continues the approach developed by the public in cooperation with the Clean Lakes Coordinating Council, Coeur d'Alene Tribe, IDEQ, and others when they developed the Coeur d'Alene Lake Management Plan. Full implementation of the Coeur d'Alene Lake Management Plan is included in the preferred alternative to continue positive improvements in lake-water quality resulting from controls previously implemented.

[5] Based on an average lead concentration of 3,000 mg/kg; average bank erosion rate of 0.1 foot per year, 60% of bank length stabilized using bioengineering; and 40% of bank length remediated using bank wedge removal followed by stabilization using bioengineering.

10.4 SPOKANE RIVER

The preferred alternative for the Spokane River is Alternative 4. 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 shoreline sites and also a subaqueous site where sediment has accumulated directly behind Upriver Dam. These areas will be addressed to protect human health and the environment, and to comply with federal and state laws. A combination of access-controls, capping, and removals have been evaluated.

10.5 FUTURE REMEDIAL ACTIONS

The preferred alternative will include remedial actions that are anticipated to achieve remedial action objectives for protection of human health. However, implementation of a remedy that would achieve remedial action objectives for ecological protection would be substantially more costly and time-consuming. Although the decision on whether to identify Alternative 3 in the ROD as the preferred alternative and then incrementally phase the cleanup post ROD, or to limit the ROD to a portion of Alternative 3, will not likely be made until after the public comment period, the preferred alternative first phase will include an increment of cleanup that is designed to achieve visible, measurable improvement with respect to water quality to sustain fish, waterfowl protection, and particulate metal transport reduction, but would not achieve remedial action objectives basinwide. As previously discussed, attainment of RAO's requires the comprehensive remedy. Phasing allows EPA to value engineer the effectiveness of the earlier phase source-specific remedial actions and adjust future remedial actions accordingly. Subsequent RODs or amendments would serve to identify how additional phases would be implemented so as to complete necessary Basin-wide cleanup.

During and following implementation of the initial increment of ecological cleanup, monitoring would be used to identify additional remedial actions to continue progress toward attainment of remedial action objectives during subsequent increments.

10.6 NEEDED POST-ROD TREATABILITY STUDIES

Cleanup of the Basin, particularly with respect to ecological protection, would use a number of different remedial technologies. Some of these technologies would be applied over large areas, potentially larger than ever previously implemented. Implementation of innovative, untried technologies may be needed to successfully remediate the Basin. As a result, a relatively large degree of uncertainty is present with respect to the effectiveness of many remedial actions that may be implemented in the Basin. Treatability studies, which may range in size from bench-

scale testing to full-scale monitored removal actions, have been ongoing for a number of years and are expected to continue well into the remedy implementation phase.

10.6.1 Monitored Full-Scale Mining Waste Removal and Containment Projects

Full-scale mining waste removal and containment projects have been conducted as early removal actions within the Basin or as remedial actions within the Bunker Hill operable unit. Where monitoring data have been collected before and after the removal action, these actions can be useful for predicting the effectiveness of future actions. Monitored removal actions are summarized in Table 10.6-1.

10.6.2 Pilot and Laboratory Scale Studies

Pilot and laboratory scale studies have been conducted and are ongoing to evaluate the effectiveness of technologies and process options. The treatability studies are summarized in Table 10.6-1.

10.6.3 Potential Future Studies

A number of candidate laboratory and pilot scale treatability studies have been identified for evaluating the effectiveness of technologies for remediation of the Basin. The objectives of the candidate studies include:

- Identify reagents that are effective in removing metals from solution when employed in permeable reactive barriers.
- Identify reagents that can be applied to soils and sediments to physically or chemically stabilize contaminants in place.
- Identify optimum design configurations for constructed wetlands or bioreactors to reduce aqueous metal concentrations through use of natural processes.
- Identify amendments that can be added to indigenous non-productive soils to make them suitable as cover materials.
- Identify plant species that will rapidly establish themselves under sometimes-adverse conditions so that denuded areas can be revegetated.
- Identify stabilization/bioengineering techniques that will provide durable, self-maintaining bank and floodplain stabilization and improve habitat for aquatic and riparian fish and wildlife species.

- Identify appropriate dredging techniques and evaluate impacts from dredging and dredging effectiveness.

- Evaluate the effectiveness of confined aquatic disposal in confining and isolating sediments and reducing metal leaching from confined sediments.

- Test methods of hydraulic isolation and conduct seepage studies to identify locations where hydraulic isolation could be used to control metal-laden groundwater or surface water entering the Coeur d'Alene River system.

10.6.4 Potential Innovative Approaches

Consideration of innovative, untried approaches may be appropriate for highly impacted areas of the Basin where implementation of more conventional source control technologies may not be practical or cost effective. For example, Canyon Creek is heavily impacted by metals from a large number of sources. Instead of using conventional removal, containment, and treatment source control technologies to reduce metals concentrations in the creek water, which would be the default technology, an alternative approach would be to treat the creek water before it is discharged to the South Fork. A conceptual approach would be divert the creek through a very large permeable reactive barrier, possibly in the form of a treatment pond of a few acres in area.. A conceptual design of such an approach is shown in Figure 10.6-1. A treatability study would be required to evaluate the implementability of such an approach.

Table 10.2-2 shows potential reductions of dissolved zinc loads resulting from treatment of Canyon Creek at its mouth in combination with other actions identified under the preferred alternative. A metals reduction of 80 percent was estimated for treatment of Canyon Creek at its mouth. A reduction of zinc loads of about 27 percent in the South Fork at Pinehurst and 26 percent in the Coeur d'Alene River at Harrison is estimated. Preliminary feasibility analyses indicate a design treatment capacity of 60 cfs would be needed to achieve 80% metals removal. The estimated size of the treatment pond would be 8 to 10 acres, with an estimated capital cost of about $23 million and an estimated annual O&M cost of about $2.3 million.

A second alternative approach would be to reduce the toxicity of the water to aquatic life using chemical additions. The toxicity of the water decreases with increasing hardness, and chemical additions could be used to increase the water hardness.

10.7 PROBABILISTIC ANALYSIS OF POST-REMEDIATION METAL LOADING

A probabilistic analysis has been developed to quantitatively estimate potential post-remediation metal loadings in major streams of the basin. The analysis quantifies the probability that a remedial alternative or proposed remedy would actually meet cleanup goals. The analysis also

provides estimates of remedial effectiveness (remediation factors) required to meet target metal loadings and concentrations with specified probability at selected stream monitoring stations.

The analysis is being used to help select and prioritize cleanup efforts for the preferred alternative. The six remedial alternatives documented in the draft FS have been analyzed to estimate post-remediation loadings and the probability of meeting TMDLs and AWQC in the South Fork at Pinehurst and in the Coeur d'Alene River at Harrison. These results, together with similar estimates for various potential configurations of the preferred alternative, are being used to help develop the preferred alternative.

10.7.1 Objectives

The motivation for using a probabilistic analysis stemmed from the inherent complexity and resultant uncertainty associated with metal loadings and concentrations in basin surface waters, particularly under potential future, post-remediation conditions. The probabilistic analysis provides a rational way to deal with the uncertainty in predictions of the true future effectiveness of any given remedial alternative.

The analysis quantifies the probability that any given present estimate of future loading would be the *true* future value. From this, the probability that the true future loading would actually meet remediation goals is quantified. The probabilities measure the *reliability* that remediation goals would be met, where high probabilities indicate high reliability, and vice versa. The analysis thus allows reliable estimates to be made under the existing conditions of uncertainty.

10.7.2 Methods

Based on statistical analysis of available historic measurement data, lognormal probability distributions were found to accurately characterize the natural variability inherent in the pre-remediation or current stream loadings and concentrations in the basin. Lognormal distributions were also used to coherently quantify the uncertainty in the future effectiveness of potential remedial action based on the various (uncertain) variables used to estimate that effectiveness.

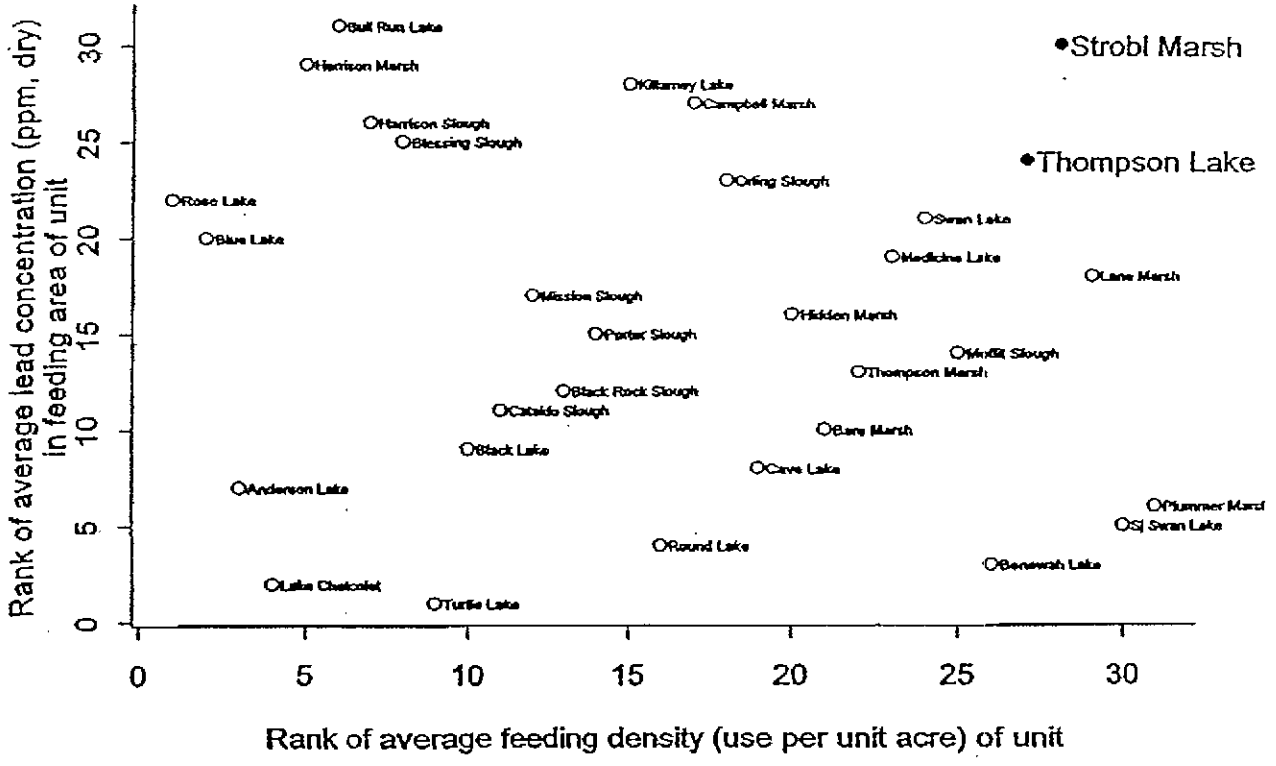
The uncertainty in post-remediation loadings mathematically combined both the natural variability in the stream system and the predictive uncertainty in the estimated remedial effectiveness. The resultant estimates quantify the probability that any given present estimate of future loading would be the true future value. Probabilistic estimates include the:

- Ratio of future loading over time to the TMDL loading capacity—termed the "load ratio"—which is also equal to the ratio of concentrations to AWQC. A load ratio of one or less means that the estimated loading is equal to or less than the

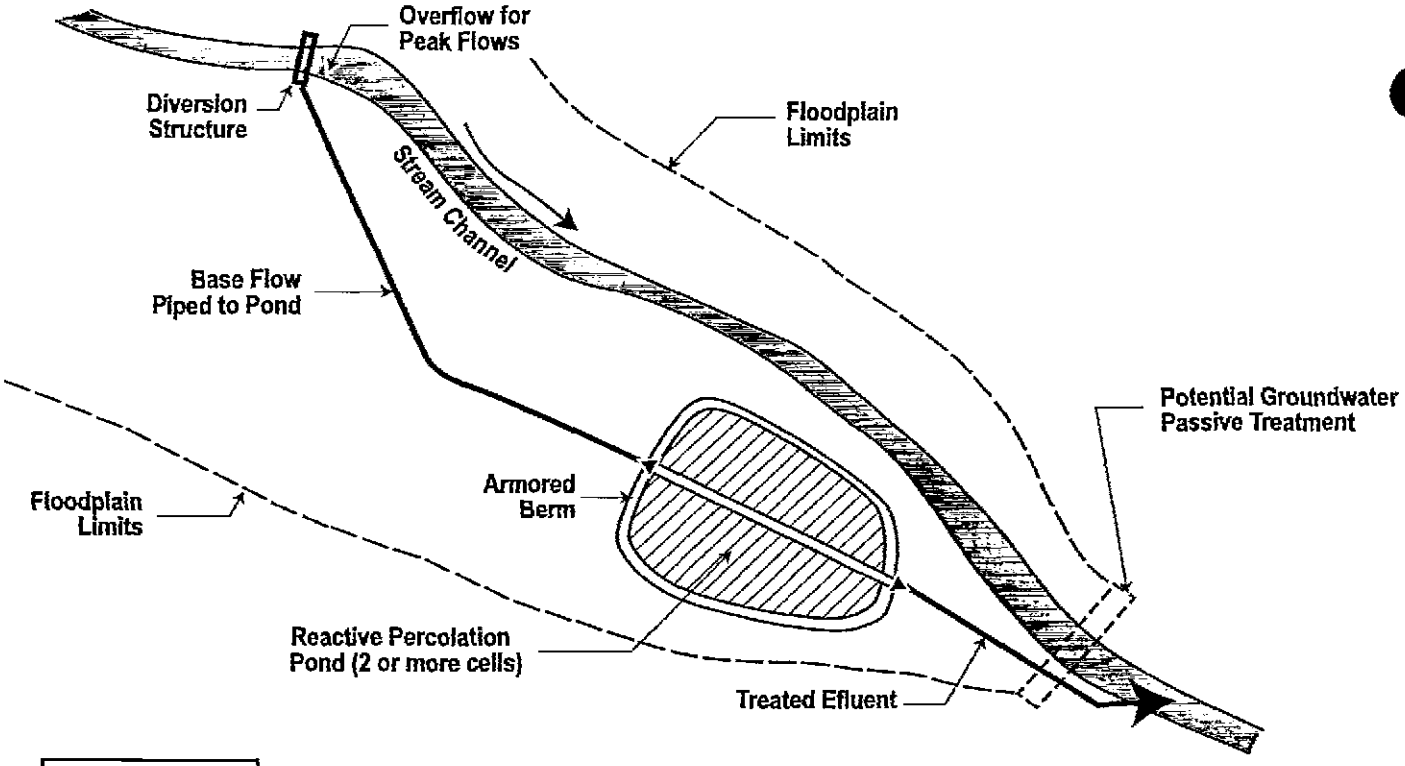
TMDL load capacity and that AWQC are expected to be met. (A load ratio of, say, 10 would indicate that loadings are 10 times the TMDL loading capacity, and that AWQC would be exceeded by a factor of 10). Estimates include load ratios having a 90 percent probability, or "reliability," of not being exceeded by the true future values.

- Expected values of remediation over time, including the post-remediation loadings having a 90 percent probability or reliability of not being exceeded by the true future loading.

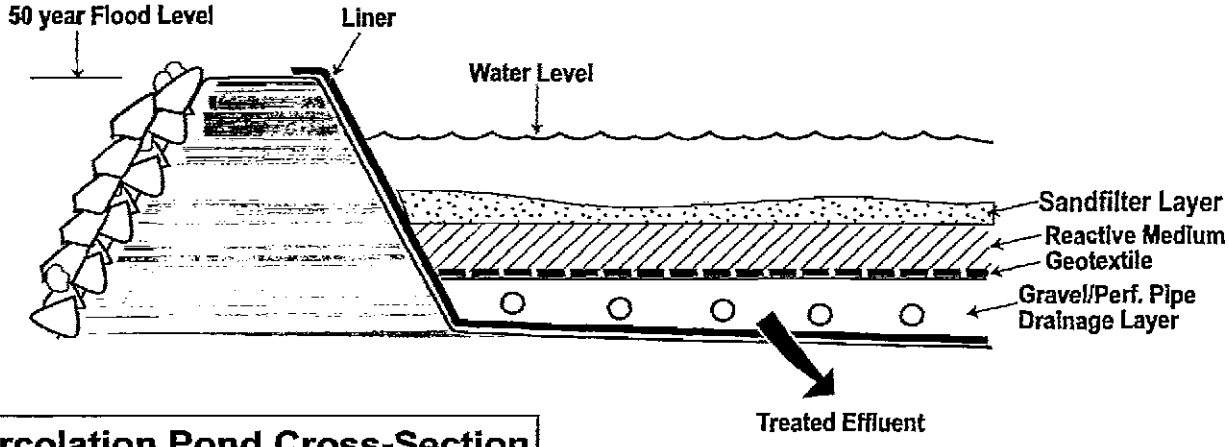
- Reduction of current loading needed to meet the TMDL loading capacity (and thus AWQC) with specified probability or reliability.



EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	RRB16	**Figure 10.2-1** **Prioritization Chart for Wetlands in the Lower Basin Based on Lead Concentration and Waterfowl Feeding Density**



Plan View



Percolation Pond Cross-Section

Note: This typical conceptual design was developed for feasibility-level analysis of remedial alternatives. Actual designs would be developed during remedial design based on the remedy selected in the ROD and site-specific conditions and requirements.

EPA REGION 10	027-RI-CO-102Q Coeur d'Alene Basin RI/FS REMEDY REVIEW BOARD	Doc. Control: 4162500.06664.05a Generation: 1 FS-08b 060101	Figure 10.6-1 Conceptal Design of Stream Flow Treatment in a Reactive Percolation Pond

Table 10.1-1
Preferred Alternative for Protection of Human Health

Media	Description of Preferred Alternative	Estimated Costs		
		Capital Cost	Annual O&M [a]	Total 30-Year NPV [b]
Soil	Information and Intervention and Partial Removal and Barriers	$84,500,000	$200,000	$87,000,000
Drinking Water	Public Information and Multiple Alternative Sources	$1,675,000	$43,000	$2,200,000
House Dust	Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning	$3,100,000	$83,000	$4,200,000
Fish Consumption	Information and Intervention and Monitoring	$0	$75,000	$930,000
Total		$89,300,000	$400,000	$94,000,000

[a] Average annual cost of O&M over 30-year period. Actual O&M costs will vary from year to year.

[b] Net present value including 30 years of O&M discounted at 7%. Capital costs are not discounted.

Table 10.2-1
Suggested Candidate Interim Benchmarks for Ecological Protection

Area	Benchmark	Estimated Results of Remedy Implementation	Estimated Cost[a]		
			Capital	Annual O&M	Total 30-year NPV
Ninemile Creek (Upper Basin) at mouth	Reduce metals concentrations in surface water and improve physical stream structure compatible with an adult native fishery	About 80% reduction in dissolved cadmium and zinc concentrations. Before implementation Cadmium = 22±10 µg/L Zinc = 3400±1600 µg/L After remedy implementation Cadmium = 4.4±2.3 µg/L Zinc = 680±350 µg/L (70 µg/L in DM)	$53,000,000	$500,000	$59,000,000
Pine Creek (Upper Basin)	Reduce metals concentrations in surface water and improve physical stream structure compatible with a fully-functional fishery	About 88% reduction in dissolved cadmium and zinc concentrations Before implementation Cadmium = .54 µg/L Zinc = 112±50 µg/L After remedy implementation Cadmium = 0.065±0.2 µg/L Zinc = 13±6 µg/L	$38,000,000	$320,000	$42,000,000
Strobl Marsh and Thompson Lake (Lower Basin)	Reduce lead ingestion to reduce waterfowl mortality	Conservative estimate of reduction of waterfowl mortality is 17%, based on feeding density alone. A greater reduction may be achieved because the metals concentrations at Strobl Marsh and Thompson Lake are relatively high.	$23,000,000	$230,000	$26,000,000
Lower Basin Riverbanks	Reduce particulate lead loading in Coeur d'Alene River at Harrison	Estimated reduction of particulate lead loading of about 10%	$47,000,000	$330,000	$51,000,000

[a] O&M costs discounted at 7 percent; capital costs are not discounted.

Table 10.2-2
Estimated Reductions in Zinc Loads Resulting From Remedy Implementation

Remedial Actions	Reduction in Dissolved Zinc Load	
	South Fork at Pinehurst	Coeur d'Alene River at Harrison
Comprehensive cleanup of Ninemile Creek and Pine Creek watersheds + upgraded treatment of Bunker Hill mine water	15%	12%
Comprehensive cleanup of Ninemile Creek and Pine Creek watersheds + upgraded treatment of Bunker Hill mine water + treatment of Canyon Creek at mouth using passive reactive barrier	27%	26%

Table 10.6-1
Summary of Monitored Removal Actions and Treatability Studies in the Coeur d'Alene Basin

Location	Agency	Description
Ninemile Creek: Interstate millsite removal action	SVNRT	Approximately 70,000 cubic yards of materials were removed from a floodplain and adjacent slopes during the summer of 1998. The materials were placed in an on-site repository, and the repository was closed during the summer of 1999.
Ninemile Creek: Success Mine and Millsite removal action	SVNRT	Groundwater intercepted using grouted cutoff wall and routed to passive water treatment system (fish bone apatite treatment medium). Constructed fall 2000.
Canyon Creek: Tailings-impacted Floodplains removal action	SVNRT	Removal of 600,000 cy of tailings from floodplains and millsites in lower Canyon Creek with disposal in a repository. Action conducted 1995-1998.
Moon Creek removal action	USFS	Removal of tailings and other contaminated materials at the Charles Dickens and Silver Crescent mine and millsites. About 130,000 cy of materials placed in an onsite repository. Two adits plugged. Action conducted 1998-2000.
Bunker Hill Operable Unit: Smelterville Flats	EPA	About 1,500,000 cy of tailings-impacted sediments removed and placed in the Central Impoundment Area. Action conducted 1998-1999.
Canyon Creek: Gem No. 3 Mine Water pilot study	SVNRT	Evaluation of combination aerobic/anaerobic passive water treatment system to remove dissolved metals. Ongoing
Upper South Fork: Morning No. 6 Mine and Millsite pilot study	IDEQ	Evaluation of different methods of revegetating waste piles. Ongoing
Bunker Hill Operable Unit: Bunker Hill Mine Water treatability study	EPA	Evaluation of active treatment options, including filtration, to achieve compliance with TMDL discharge requirements for cadmium, lead, and zinc. Completed 2000.
Lower Basin: Wetlands and Floodplains	EPA	Evaluation of soil treatment using phosphates to reduce lead bioavailability. Ongoing
Lower Basin: Dudley and Medimont	SVNRT/ IDEQ/SCS	Evaluations of bank erosion control using regrading, riprap, and hay bales. Conducted 1999 and 1994.

Notes:
EPA - U.S. Environmental Protection Agency
IDEQ - Idaho Department of Environmental Quality
SCS - U.S. Soil Conservation Service
SVNRT - Silver Valley Natural Resource Trustees
USFS - U.S. Forest Service

11.0 STATEMENTS FROM STAKEHOLDERS AND STATES

As this is an followup meeting to provide additional information and the stakeholder positions have not substantively changed, no stakeholder followup is believed necessary. However, we have received a report from an interested community group, of which an excerpted summary is attached as Appendix A.

Because the preferred alternative is still under development, formal comment letters from the stakeholders and the States do not exist. However, EPA has worked closely with these parties during the development of the preferred alternative. The following statements have been summarized from verbal and written comments and are believed to accurately portray the positions of these parties with respect to the current status of the preferred alternative as it is presented in this document.

11.1 STATE OF IDAHO

EPA and the State of Idaho have been working closely together in the development of the preferred alternative. The State supports protection of human health in the communities and common use areas as the top priority of the preferred alternative. The State also supports the incremental approach to implementation of the ecological remedy. The IDEQ has been actively involved in conducting and monitoring early removal actions, pilot studies, and treatability studies that will provide information on the types of remedial actions that will be effective in the Basin. The State of Idaho is very concerned about the use of remedies that would have high operations and maintenance requirements, such as active water treatment.

11.2 STATE OF WASHINGTON

The primary goals of the State of Washington as part of the near-term preferred alternative are to re-establish unrestricted access to shoreline recreational areas and remediate important fishery sites along the Spokane River, and to eliminate the potential for contaminant redistribution further down river. Washington is very concerned about the risks that exist to recreational users along the Spokane River. These exposures include contaminated beaches and fish consumption. The State of Washington does not support long-term reliance of institutional controls as an approach for reducing health risks along the Spokane River.

The State of Washington supports continued monitoring of the upper reaches of the Spokane River. This monitoring program approach will be required as long as constituents of concern from current and historical releases pass into the state of Washington.

The State of Washington believes surface water quality is being profoundly impacted in the vicinity of Kellogg and the BHSS (OU 2). The State of Washington believes the interim preferred alternative must include significant actions to define and continue implementing appropriate cleanup technologies that will significantly reduce dissolved zinc entering into the South Fork of the Coeur d'Alene River in this part of the Basin.

11.3 COEUR D'ALENE TRIBE

The Coeur d'Alene Tribe generally agrees with the proposed remedy for protection of human health in the communities of the Upper Basin. The Tribe is continuing to work with EPA and others to resolve human health issues in the Lower Basin.

The Tribe is also very concerned about the risk that exists to recreational and subsistence users in the Lower Basin. The Tribe believes these exposures include, but are not limited to, recreating on contaminated beaches, swimming in the Coeur d'Alene River, gathering water potatoes and other cultural plants throughout the wetlands, and eating large amounts of fish.

An important goal of the Coeur d'Alene Tribe is the full return of cultural resources and recreational uses in the Basin. Unrestricted use of these resources in the Lower Basin for Tribal cultural practices will require an aggressive long-term cleanup effort.

To reduce these exposures, the Coeur d'Alene Tribe would like all remedies that address wetland risks to waterfowl to contain habitat enhancement components that enhance water potato grounds as well as recreational beaches. The Tribe does not endorse the long-term use of warning signage in the Lower Basin as a solution to the environmental contamination.

Some questions have been raised by the Coeur d'Alene Tribe and others regarding the need to determine potential risks to humans who eat whole fish and fillets taken from fish in the lake. Previous fish tissue sampling efforts did not include whole fish from Coeur d'Alene Lake and fillets were found to contain elevated metal concentrations. As a result, some uncertainty remains about the potential risks resulting from eating fish from the lake. The Tribe will continue to seek a means to resolve this important human health concern.

11.4 SPOKANE TRIBE

The primary goal stated by the Spokane Tribe is to return their resources back to the pre-contaminated conditions in the shortest time possible to enable unrestricted use for subsistence and other cultural purposes. The Tribe believes that, while the incremental approach may influence short-term spending of Superfund dollars in the Silver Valley, an aggressive approach to cleanup will be required to comply with the NCP and to achieve long-term goals of protecting human health and the environment. Thus, the incremental approach cannot be employed without

also addressing present threats to human health and the environment that are not included in the preferred alternative. The Spokane Tribe opposes long-term institutional controls.

The Spokane Tribe has expressed concerns that the previous studies do not fully account for the metals exposures that may be experienced by tribal members that practice traditional cultural ways, including a subsistence lifestyle. EPA and the Tribe are cooperating in planning additional testing and studies to evaluate these exposures.

The Spokane Tribe also envisions the need for monitoring of water, sediments, fish, and vegetation of the Reservation. This monitoring program approach will be required as long as constituents of concern from current and historical releases pass into the reservation. A plan for monitoring the river where it passes through the reservation has been submitted by the Spokane Tribe to EPA for funding.

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APPENDIX A

"Get It Done, Collaborating for Basin Cleanup"
Coeur d'Alene Consensus Process
September 2000 – March 2001

"Get it Done, Collaborating for Basin Cleanup"
Coeur d'Alene Consensus Process, September 2000 – March 2001

Executive Summary

The consensus process focused on remediation of the sources addressed in the Coeur d'Alene Basin Feasibility Study and defined a general "common ground" remedial solution for the following four issues:

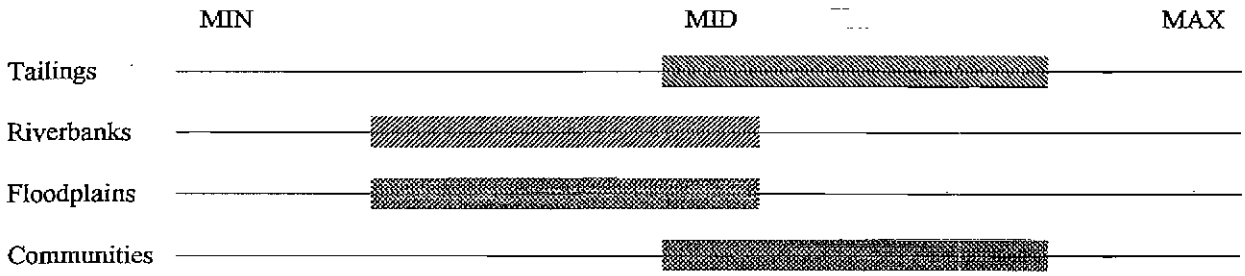
- Tailings along the South Fork and its Tributaries in the floodplain and on uplands that are major sources of zinc in the water;
- Banks and bed of the Coeur d'Alene River that are a major source of lead in the water;
- Floodplains along the River from Cataldo to Harrison that are a source of lead exposure to wildlife; and
- Sources of lead in communities that may be an exposure source to children including soil, indoor dust, and house paint.

These issues were selected for this process because they are major concerns in the Basin Feasibility Study. At the same time it was recognized that many other issues such as interim goals for water quality and priorities for source removals will require difficult decisions and may warrant a focused process for consensus building that can be part of implementation. In addition, topics not in the Basin Feasibility Study, such as the "Box", Coeur d'Alene Lake, Spokane River, TMDLs, and the UPRR right-of-way may be appropriate for a similar process. The list of stakeholders participating in the process is attached. While participation levels varied, all Stakeholders received ongoing communication and information.

The process dealt with the difficult interface between science/engineering, regulatory policy and community values, although timing of the effort did not allow for a detailed discussion of technical considerations. The large-scale technical facts were represented and incorporated into a framework of community values and acceptance. Discussion about national environmental policy was not addressed.

The Stakeholders identified a range of remedial actions within a broad range from maximum (relying predominately upon removals) to minimum (relying heavily upon natural attenuation, institutional controls, and monitoring). The "common ground" ranges of remedial activity are illustrated in the following figure.

Figure 1. Ranges of "Common Ground" for Remedial Activities



The ranges of "common ground" were not developed from detailed technical discussion, rather they reflect a coupling of values of participating Stakeholders with a general understanding of the technical aspects of the issues.

General Points of Consensus. There was a strong feeling that the remedy must protect human health and the environment and that those goals could be achieved through remediation within the range of "common ground". Remediation within the "common ground" range was believed to address habitat improvement in the Basin. While the group discussed the difficult questions about how to manage environmental disruptions, truck traffic, wear and tear of infrastructure, O&M and liability for repositories, funding, institutional controls and O&M of remedial actions the only solution identified was to minimize these impacts by careful and thoughtful decisions on removal actions. It was noted that these questions need to be addressed under a mid-range solution but that their magnitude is less than with a remediation plan utilizing maximum removal. In addition, it was noted that managing these issues will require a good working relationship among all of the Stakeholders and that a collaborative, open and inclusive implementation structure will foster necessary cooperation. It was recognized that there was a need to improve communication between those with technical understanding and those Stakeholders in the community without technical backgrounds.

In addition to the identification of a "common ground" remedial solution, there was strong consensus that a similar forum should be continued to assure public input throughout the duration of remediation activities. Other points of consensus relating to remedial implementation were:

- Management, direction and oversight of implementation should include Federal, State, Regional, Tribal and community involvement;
- To the extent practicable, the goal for utilization of the local workforce should be a "Project Labor Agreement," which would guarantee local hire, payment of prevailing wage, family health insurance and retirement benefits, and apprenticeship opportunities;
- Private property must be respected, i.e. no eminent domain; and
- Management of the remediation should be an iterative design process that reflects "learning from experience" with local input.

There was consensus that cleanup should start with sources representing the greatest impacts to human health and the environment and that work in the "Box" should be finished. Among a number of other important factors this group identified the importance of using cost/benefit analysis to guide prioritization. Concerns about uncertainties and unknowns in the effectiveness of the various solutions were recognized. In general, concerns were expressed about the:

- Unknowns in the effectiveness of remedial actions to achieve goals;
- Impossibility of complete removal;
- Potential secondary effects and disruptions (environmental and socio-economic) from remedial actions;
- Consequences of leaving inaccessible source material in place; and
- Practical considerations such as accessibility, dust and haul-traffic as well as the need to prevent recontamination.

Concerns about funding the capital costs and O&M were recognized. The need to maintain areas for recreation and access to those areas was identified. It was noted that implementation must be

based upon accurate technical information and that peer review may be necessary when there is significant disagreement about technical points. Also, technical facts must be distinguished from environmental policy.

Tailings. There was consensus that remedial activities within the "common ground" range for tailings should aggressively remove accessible tailings in the floodplain of the upper Basin that are contributing a major load of metals to the River. Tailings out of the floodplain should be stabilized against erosion and human health exposures. It was recognized that there are large amounts of inaccessible tailings under I-90, communities, and private property and that treatment of contaminated water from these sources is the preferred solution if this load needs to be reduced. Planning and implementation of the remediation must always be open to emerging technologies. Low priority sources such as waste rock were not addressed in this process.

Riverbanks, Bed and Floodplain. Selection of specific remedial activities within the "common ground" range for riverbanks and floodplains called for a balance among the tradeoffs of disruptions of removals, economic and social costs, use restrictions on public and private land, and the time for achieving goals through natural attenuation. The "common ground" range includes a mix of localized removals and management of soil in-place. There was consensus that prioritization is necessary and that Thompson Lake, Swan Lake, and Stobel Marsh were priority areas. Concerns were identified about the unknowns relating to the natural processes operating in the River and its floodplains, and the uncertainty in predicting the outcome of remedial actions. It was agreed that more study is needed to make detailed decisions on what is necessary to stabilize the riverbanks and bed against erosion. There was an agreement that soil treatment, to reduce bioavailability of lead and improve productivity, is an option worth exploring. Development of technologies should learn from what is already in use by landowners and being studied in other States.

Communities. Remedial activities within the "common ground" range for communities should include outdoor and indoor sources, intervention during remediation, long-term institutional controls and education on lead exposure. The remedy will provide a level of effort that, (1) is protective enough of children's health for people to want to buy property and live in the communities, (2) does not destroy the communities with massive removals, and (3) will not strangle the communities with long-term institutional controls. There seemed to be agreement that an endpoint of no more lead-testing and no more "digging" is desirable. Education and controls against recontamination were identified as key aspects of a remedy to deal with the situation of many communities built on mine waste materials and the impossibility of removing all of the lead. It was noted that while this range of cleanup effort addresses soils and dust with concentrations greater than an action level, it does not address selection of the action level. The opinion that a standardized finger-prick method for blood-lead testing should be used was not countered.

Consensus Process. Planning of this consensus effort began in spring of 2000. At least 7 days of workshops and meetings were held between September 2000 and February 2001. The scope and schedule of the process was set to correspond with that of the Remedial Investigation/ Feasibility Study being prepared by EPA for the Basin. Topics that were not in the Basin Feasibility Study such as the "Box", Coeur d'Alene Lake, Spokane River, TMDLs and UPRR right-of-way were not part of the scope of this process.

The process generally followed four steps:
1) planning to define the scope and practical considerations of time and resources;
2) brainstorming to identify the issues within the scope for discussion and document all comments and points of view;
3) organizing the information from the participants to define a range of alternatives and their associated concerns; and
4) making choices and defining common ground.

Prior to the first meetings, many of the Stakeholders were interviewed about their hopes and expectations for the process. There was a general commitment among those interviewed that "personal agendas" and "baggage" must be left at the door, and broad agreement that a process to have constructive dialogue with others of differing perspectives was welcome. Since this was a new experience for many of the participants, "trust building" exercises were included in the first couple workshops.

The sessions were open and information distributed freely, providing the opportunity for Stakeholders to work with their neighbors. All information was put up on large boards for all to see and challenge. The open discussions provided a forum to understand each other's point of view and to appreciate the other's dilemma. The methodical development of the range of cleanup alternatives allowed learning and understanding of pros and cons that come along with each alternative.

Three Public Summit meetings were held near the close of this effort. Comments from the Public Summit generally reflected many of the same thoughts that had been voiced by the participants:
- How will the outcome of this process be used?
- How will the effort be continued both in schedule, scope and process?
- Many issues of concern were not included in the scope of this first effort such as UPPR Rails-to-Trails, Burke Canyon, TMDLs, financing and the Superfund designation.
- The desire for a project labor agreement.
- The need to balance environmental improvement with negative impacts such as top-soil depletion.

In addition comments from both those that believe the process focused on too much cleanup and those that believed that process focused on too little cleanup expressed skepticism that the process represented their views. There was also concern expressed about the accuracy of government sponsored technical information and the need for peer review. It was noted that there needs to be more effort given to bridge the interface between technical information and values of the communities.

As this activity comes to a close, many Stakeholders have confirmed the value of discussion with other Stakeholders with differing perspectives. The process introduced a vehicle to the Stakeholders of the Coeur d'Alene Basin to bring other issues to the table for discussion and problem solving. Participants complemented the candor and respectful tone of the discussions and noted that the level of agreement increased as understanding increased. Regret was expressed about the difficulty in scheduling workshops so that everyone could regularly attend and the pressure of deadlines that were inherent in the process.

Stakeholders Identified for CdA Basin Consensus Process

Benawah County Commissioners
Building and Construction Trades Council
Coeur d'Alene Basin Restoration Project Citizens Advisory Commission
Coeur d'Alene Basin RI/FS Task Force Citizens Advisory Committee
Coeur d'Alene Tribe
Cities of Coeur d'Alene, Post Falls, Harrison, Mullan, Osburn, and Wallace
CLEAN - (Community Leaders for EPA Accountability Now)
Congressman Butch Otter
Idaho Department of Environmental Quality
Idaho Department of Lands
Idaho Fish & Game
Kootenai County Commissioners
Kootenai Environmental Alliance
Lake Shore Property Owners Association
Landowners and interested citizens
Mining Industry
Panhandle Health District
Senator Clyde Boatwright
Senator Larry Craig
Senator Mike Crapo
Shoshone County Commissioners
Shoshone Natural Resources Coalition
Spokane County Commissioners
Spokane River Property Owners Association
Spokane Tribe
U.S. Bureau of Land Management
U.S. Environmental Protection Agency
U.S. Fish & Wildlife

TABLE B2-2

Summary of Previous Remedial Actions in Upper Basin

Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Operable Unit 2 (OU 2)					
Hillsides	U.S. Environmental Protection Agency (USEPA)/Idaho Department of Environmental Quality (IDEQ)	1990 - 2005	Hillside terracing and vegetation programs were implemented in 1990-1994 by Potentially Responsible Parties (PRPs). Government-led efforts for hillsides revegetation were initiated in 1996. From 2000-2005, revegetation of hillsides included hydroseeding, application of soil amendments, and planting of hardwood trees and shrubs. Sites are evaluated annually and monitored for performance, with maintenance performed as needed. A long-term Operation and Maintenance (O&M) Plan and performance standards were developed. Since 2005, a large portion of the Hillsides within OU 2 has been transferred to a private party for development.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Central Impoundment Area (CIA)	USEPA/IDEQ	1995 - 2000	Beginning in 1995, site removal materials and demolition debris from the Mine Operations Area began to be consolidated in the CIA. In 1999, residential soils from USEPA's yard removal program in the Basin were deposited in the CIA. In addition, some contaminated soil from State of Idaho Trustee projects were also disposed of in the CIA. From 1997 through 1999, approximately 1.2 million cubic yards (cy) of material from Smelterville Flats and additional materials from mine waste dumps and soil from gulch area removal actions were placed in the CIA. From 1999 to 2000, a geomembrane cover system was installed on the surface of the CIA with the exception of the 5-acre Central Treatment Plan (CTP) sludge disposal cell. The CIA cap does not extend down the side slopes of the CIA. The side slopes either were covered with a minimum 6-inch layer of growth media and vegetated or were rocked, depending on the steepness of the slope. In October and November 2000, perimeter fencing was installed to limit access to the CIA. Access roads were final graded, and the construction contractor was demobilized in November 2000.	No material was removed as part of this action. The CIA received approximately 2.7 million cy of material from other cleanup actions prior to closure.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Bunker Creek	USEPA/IDEQ	1996 - 1997, 2001, 2002	The majority of the Bunker Creek action was conducted in 1996 and 1997. The action consisted of the reconstruction of approximately 7,600 linear feet of creek channel, including the creation of a low-flow channel and floodplain. The low-flow channel was lined with rock to prevent erosion, and the floodplain was seeded. The reconstruction of the creek channel included source removal, revegetation, culverts for road crossings, and Institutional Controls Plan (ICP) barriers (minimum 6-inch) and hydroseeding at the surface of all disturbed areas. In 2001, riparian plantings and near channel capping were completed. Fencing was installed between the Creek and the Union Pacific Railroad (UPRR) Right of Way (ROW)/Trail in 2002. No maintenance has been required since completion of remedial action.	Approximately 77,000 cy contaminated material was removed and placed in the CIA.	Second Five-Year Review (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Smelter Closure Area (SCA)	USEPA/IDEQ	1996 - 1998; 2005	Construction and landfilling at the SCA began in 1996 and was completed in 1998. The foundations of the Lead Smelter were used as the base of the approximately 30-acre SCA. Demolition debris from the Lead Smelter and the Phosphoric Acid and Zinc Plants, located in Government Gulch, were consolidated in the SCA. Boneyard soil and larger wood and metal debris was also deposited in the SCA. Slag and contaminated soil from various site removals were used as in-fill materials to minimize void spaces and the potential for future settlement. The Principal Threat Materials (PTM) cell was constructed within the boundary of the SCA in 1996. This geomembrane-lined mono-cell has a seep collection system that conveys seepage, if generated, to the CTP for treatment. PTMs and stabilized mercury contaminated materials were deposited in the PTM cell beginning in 1996. The PTM volume placed in the cell is approximately 80,000 to 100,000 cubic yards. The PTM cell was closed with a geomembrane cover in 1997. Contaminated soil from other site removal actions was placed on top of the PTM cell cover as needed to complete overall grading of the SCA. A shallow toe drain was const	No material was removed as part of this action. The SCA received approximately 700,000 cy of material.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Government Gulch	USEPA/IDEQ	1996 - 1998	The majority of the Government Gulch action was completed between 1996 and 1998. Nearly 400,000 cubic yards of material was removed form the gulch. The entire gulch floor received a 6-inch ICP barrier cap of clean soil typical for future industrial use. Government Creek was reconstructed from the upper reaches of the gulch to its confluence with the South Fork Coeur d'Alene River (SFCDR). Above ground structures associated with the Phosphoric Acid/Fertilizer Plant and Zinc Plant were demolished with the exception of the Zinc Plant Concentrate Handling Building and Warehouse. Salvageable material was removed and recycled and the remainder of the materials were placed in the SCA. The tall stack at the Zinc Plant was demolished and buried in place.	Approximately 400,000 cy of material was removed and placed in the SCA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)

TABLE B2-2
Summary of Previous Remedial Actions in Upper Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
			In 2001, riparian corridor planting was conducted at applicable portions of Government Creek. In the spring of 2003, a section of upper Government Creek required maintenance and channel rebuilding after runoff and creek flows eroded the channel. In 2005, sewer and water lines extending from the mouth of the gulch to the Zinc Plant were installed to support future development within the gulch. Fill material from the hillsides behind the Zinc Plant was placed on the gulch floor near the former location of the cobalt storage bins to support buildings used for a public gun range. In 2007, the developer of the golf course property located east of the gulch began diverting water from Government Creek to the golf course property.		
Lower Government Gulch	USEPA	2001 - 2002	Vacant portions in lower Government Gulch were capped with 6 inches of gravel, including the area just south and west of the McKinley Avenue intersection with Government Gulch up to the Silver Valley Lab and east of the hillside, the area between the Enyeart Lumber Yard and Bunker Creek, and the area between the Enyeart Lumber Yard and the I-90 interchange in Smelterville. The Enyeart Lumber Yard was capped with asphalt and graded to drain to a newly installed storm drain system.	No materials were removed as part of this action.	Second Five Year Review, (USEPA 2005b) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Smelterville Flats – North of I-90	USEPA	1997 - 2004	Source removal action, capping, revegetation, and stream bank stabilization were conducted in 1997-1998. Later actions included riparian plantings of trees and shrubs. In addition, noxious weed control programs were conducted periodically from 2001 through 2004 by the U.S. Army Corps of Engineers (USACE). The S&P Truck Stop area was re-capped by PRPs in 2001, and was re-remediated by USACE later in 2001. The City/Gun Range Road east of the S&P Truck Stop was capped in 2004.	Approximately 1.2 million cy of tailings were removed from Smelterville Flats and placed in the CIA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Smelterville Flats – South of I-90	USEPA	1997 - 2001	In 1997-1998, source removal action included re-grading, capping, and surface water management. Improvements to surface water runoff control were implemented in 2001, consisting of a vegetated swale and storm drain pipe. The North Idaho Recycle Yard was also recapped in 2001. No maintenance has been required since completion of the remedial action.	Materials removed are included above in North of I-90 description.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Central Treatment Plant (CTP)	USEPA	1994 - 2006	From 1994-1995, the Lined Pond was constructed adjacent to McKinley Avenue. From 1996-1997, studies to prioritize maintenance needs and to optimize operation of CTP were performed. In 1997, miscellaneous O&M, construction of direct discharge line from mine to the Lined Pond, and ICP capping on CTP property was conducted. In 2001-2002, a new direct feed mine water pipeline was constructed from the Kellogg Portal to the CTP aeration basin. Emergency repairs and upgrades to the CTP and Lined Pond were completed from 2004-2007, including a new lime storage, make-up, and feed system consisting of two 14-foot-diameter, 100-ton silo assemblies and other equipment.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Milo Gulch and Reed Landing	IDEQ, USEPA	1995 - Ongoing	Beginning in 1995 and extending through 2000, source removal and disposal at Guy Caves was conducted and a water diversion dam and pipeline on the main stem of Milo Creek were installed. In 1997 and 1998, the underground Milo Creek conveyance system was reconstructed following a major flood event. A permanent concrete sediment basin was installed and connected to a new high-density polyethylene (HDPE) conveyance system. Remedial action of lower Milo Gulch was essentially complete in 2000. At Reed Landing, re-grading to stable slope, disposal of materials at the CIA and Guy Caves, and construction of a reinforced concrete emergency overflow channel were performed. The Upper Milo Basin requires additional remediation, which is currently pending, in accordance with the 2001 Record of Decision (ROD) Amendment for OU 2. Routine maintenance is ongoing.	Approximately 30,000 cy of material were removed from Milo Gulch.	Second Five-Year Review (USEPA, 2005b) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Railroad Gulch	USEPA	1997	In 1997, reconstruction of the portion of the gulch drainage channel that extends across the eastern end of the Boulevard Area, crosses under McKinley Avenue, and then connects to Bunker Creek, was conducted. The channel was lined with riprap and a sedimentation basin was constructed on the south side of McKinley Avenue. Adjacent areas were capped and revegetated. No maintenance has been required since completion of the remedial action in 1997.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)

TABLE B2-2

Summary of Previous Remedial Actions in Upper Basin

Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Mine Operations and Boulevard Areas	USEPA	1995, 1997	Demolition of structures, source removal actions, site grading, capping, and revegetation were conducted in the Mine Operations Area in 1995. In 1997 in the Boulevard Area, source removal action, replacement with clean soil, re-grading, surface water management, and revegetation was conducted. No further remedial work has been conducted. No maintenance has been required since completion of these remedial actions.	Approximately 10,000 cy were removed from the Mine Operations Area and approximately 40,000 cy from the Boulevard Area, then placed in the CIA and SCA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Deadwood Gulch	USEPA	1995 - 1998; 2001	A source removal action (Arizona and Sierra Nevada Mine dumps) was conducted in 1995-1998, in addition to stabilization and reconstruction of the creek channel and revegetation. Riparian corridor planting of Deadwood Creek was conducted in 2001. No maintenance has been required since completion of the majority of the remedial action in 1998.	Approximately 500,000 cy of contaminated material was removed from Deadwood Gulch and placed in the CIA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Lower Deadwood Gulch and Miscellaneous Adjacent Areas	USEPA	2002	The mouth of Deadwood Gulch was capped with 6 inches of gravel during an effort to open McKinley Avenue to the public. Other areas capped included the parking lot west of the A-4 Gypsum Pond, the snow storage area east of the A-4 area lined pond, McKinley ROW shoulders, the southwest side of the old Slag Pile Area, and the east security gate. Capping was also conducted for the direct feed mine water line project in the CTP area and along the slopes from McKinley north to the UPRR trail.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Upper Magnet Gulch	USEPA, Gulf Resources	1992 - 1999, 2006	In 1992, Gulf Resources removed the copper dross flue dust pile from upper Magnet Gulch to a temporary location within the Lead Smelter Area. A source removal action was conducted in 1995-1999 by USEPA. It included removal of the A-1 Gypsum Pond, reconstruction of the creek channel, and revegetation. No maintenance has been required since completion of the removal action in 1999. Following transfer of the property from the State of Idaho to Galena Ridge in 2006, a gabion structure was installed in Magnet Gulch to provide road access to the golf course development. Magnet Creek passes through the gabion structure in an approximately 6-foot by 6-foot culvert.	Approximately 200,000 cy of contaminated material was removed from Upper Magnet Gulch and placed in the SCA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
A-4 Gypsum Pond	Potentially Responsible Party (PRP): SMC	1996 - Present	The following actions were performed in 1996-2000: construction of run-on ditches along the up-gradient perimeter, removal of the upper portion of an existing north perimeter embankment and re-grading of the downstream face of the embankment, rerouting of Magnet Creek over the A-4 Gypsum Pond and then excavation and lowering of the Magnet Gulch channel down to the native soil at the floor of the Gypsum Pond, and installation of a seepage barrier along the north perimeter of McKinley Pond and a new sealed culvert under McKinley Avenue from McKinley Pond. Later actions included installation of a French drain along the toe of the north dike, construction of lined drainage channel and outfall works around the pond near the eastern perimeter to convey drainage from Deadwood Gulch to Bunker Cree, and completion of construction of a primary drainage channel and associated outfall works at the extreme west side of the A-4 closure area to convey perennial and seasonal flows that originate from the upper reaches of Magnet Gulch. In addition, numerous controls were installed to intercept and divert localized runoff to Magnet Gulch or Deadwood Gulch. Cover soil was placed on the A-4 complex at numerous times following remediation work, and in 2002 soil was applied to the west end of the A-4 in association with the completion of the Magnet Gulch channel. In 2003 SMC applied cover soil over 75 percent of the A-4 area to replace re-contaminated cover soil, and vegetation was established onsite following soil placement in 1996. The goal at that time was to minimize water infiltration into the soil cap by increasing evapotranspiration. Vegetation in much of the area was eliminated when the cover soil was replaced in 2003. Final seedin	Approximately 100,000 cy of material was removed and placed in the CIA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)

TABLE B2-2
Summary of Previous Remedial Actions in Upper Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Grouse Gulch	PRPs	1997	The Bunker Limited Partnership (BLP) removed approximately 1,200 cy of tailings above the uppermost gabion structure from locations closest to the creek and disposed it in the CIA. A new gabion dam was constructed in the lower reaches. Access roads were improved to enable access to gabion structures. The Wyoming Mine dump located near the creek was buttressed at its base to minimize the potential for erosion. Approximately 2,000 cy of material was removed and disposed in the CIA. Remedial action has not required maintenance since its completion in 1997. Shoshone County is responsible for cleaning out Grouse Gulch sediment basins to help control flooding associated with Grouse Creek in Smelterville.	Approximately 3,200 cy of material was removed and disposed of in the CIA.	Second Five-Year Review (USEPA, 2005b) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Miscellaneous OU 2 Projects					
Borrow Area Landfill	IDEQ, USEPA	1997 - 2005	The Borrow Area Landfill (BAL), located to the west of the Smelter Closure Area, was constructed in 1997 and 1998 to provide clean fill for site remediation work. In 2000, the remaining portion of the Upper Industrial Landfill was removed from Railroad Gulch and consolidated at the BAL. The BAL then received other miscellaneous site waste below the Principal Threat Materials (PTM) action level. In 2002-2005, the landfill was closed and the following activities performed: grading, surface water management, soil cover, revegetation, and settlement monitoring points. No maintenance has been required since closure of the BAL.	In 2000 and 2001, approximately 190,000 cy of material was placed in the BAL.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Area 14	USEPA	1997 - 1998, 2006	Two sedimentation ponds (Gilges Pond and Sweeney Pond) were excavated and backfilled in 1997 and 1998, respectively. In 2006, the former Sweeney Mill site and the area leased to Avista Utilities (both in the western portion of Area 14) were capped with a clean soil cap. Phased remedial action has been initiated.	The volume removed was not recorded but was less than 1,000 cy. Materials were placed in the SCA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Union Pacific Railroad (UPRR) ROW in the Box	PRP (UPRR), USEPA	1995 - Present	The following actions were performed in accordance with 1995 Consent Decree: source removals, reuse of decontaminated materials, and capping with clean barriers. Portions of the UPRR ROW adjacent to the CIA haul road were remediated, and verification sampling was performed (2000). Certification of the UPRR remedial action and incorporation of the ROW into the ICP was conducted (2001). Remaining pieces of government response areas were remediated, and the old fuel bulk plant on the UPRR ROW in Kellogg was removed and remediated (2002-2004). Portions of the UPRR ROW were paved with an asphalt path. In 2005, USEPA remediated several discrete areas: one area east of Ross Ranch, and one haul road shoulder south of the TCI building. Inspection/monitoring and O&M activities are ongoing.	Approximately 50, 000 cy of material was removed and placed in the CIA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
UPRR ROW in the Box	USEPA	2002 - 2003	"Orphan" areas along UPRR ROW in the Box were capped with 6 to 12 inches of gravel. These caps covered exposed sections of tailings or ballast. The work was completed from where the trail crosses under I-90 at Pinehurst Narrows, up to the east fence of the government property near the CTP.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
South Fork Coeur d'Alene River Removal and Stabilization Project	IDEQ , USEPA	1999 - 2004	In 1999, the north bank of the SFCDR between Theatre Bridge and the east end of the Kellogg Gun Range property was stabilized. Contaminated floodplain sediments were removed in 1999, 2000, and 2001. In 2002, the eastern half of the river reach was reconstructed, and, in 2003, the western half of the reach was reconstructed. Revegetation at the reconstructed river reaches was conducted in 2003 and 2004.	88,970 cy of contaminated material was removed and placed in the CIA.	Second Five-Year Review (USEPA, 2005b) Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Page Pond	PRP (Upstream Mining Group [UMG])	1997 - 2000	West Beach tailings were removed in the West Page Swamp. Tailings removal, capping, revegetation, and surface water controls were implemented. Limited monitoring and O&M activities are ongoing, but no additional remedial actions have been conducted in Page Pond since 2000. Page Pond is currently in use as the OU 2 ICP Repository.	Approximately 40,000 cy of material were removed.	Second Five-Year Review (USEPA, 2005b) Final Phase I Remedial Action Characterization Report (TerraGraphics and Ralston, 2006)
Small-Scale OU 2 Remedial Actions					
Miscellaneous Box Projects	IDEQ, USEPA	1998 - Present	Various miscellaneous projects were performed in support of larger remedial actions in OU 2, including City of Smelterville fencing and road and shoulder paving; remediation of Airport Road shoulders and airport area residences and airport property; development of clean water supply to users of Hangaard Arena; McKinley Avenue capping; obtaining 5,000 cy of topsoil from Hayden Jail Facility for remediation; remediation of the Pinehurst Golf Course parking lot, surrounding areas of the Kellogg Project Office, Avista Substation, east Smelterville private properties, residential properties, and ROWs adjacent to UMG-responsible properties; and establishment of a number of access controls in the Bunker Hill Box. In 2004, areas around the Kellogg Project Office were capped with 12 inches of gravel, and eco blocks were placed to stabilize the hillside. In 2005, a pilot study of sufficient capping thicknesses was performed on alleys in Kellogg. Also in 2005, a 6-inch gravel cap was placed on four discrete areas east of Smelterville Ponds.	No material was removed for the majority of these projects; 5,000 cy of clean topsoil was obtained from Hayden Jail Facility for remediation of other sites.	Second Five-Year Review (USEPA, 2005b)

TABLE B2-2
Summary of Previous Remedial Actions in Upper Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
UPRR ROW	IDEQ, USEPA	2005 - 2006	In 2005, removal of debris and placement of a 6-inch gravel cap was conducted on a haul road shoulder south of I-90 and south of the current TCI building along the UPRR ROW. Also in 2005 or early 2006, 6 inches of gravel was placed on bare patches along UPRR ROW between the meandering trail and the fence.	Included in UPRR ROW in the Box.	Second Five-Year Review (USEPA, 2005b)
Trail of the Coeur d'Alenes, East of Ross Ranch	USEPA	2005	Removal of overgrown vegetation and placement of 6-inch gravel cap was performed on a strip along the Trail of the Coeur d'Alenes.	Included in UPRR ROW in the Box.	Second Five-Year Review (USEPA, 2005b)
Slip-Lining Sloughline near UPRR ROW	USEPA	2003	A sloughline was repaired to eliminate flooding and recontamination near the UPRR ROW. The sloughline is a high-water-volume line with significant pressure. The pipe was on the verge of failure, which would have caused erosion and destruction of remediation barriers.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Kellogg Storm Sewer Pipe	IDEQ, City of Kellogg	2001	New piping was installed for the storm drain project near Kellogg City Park and Greenbelt. The new sewer pipe has prevented the continuing recontamination, caused by flooding, of the remediated soil in this area.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Pine Creek at Pinehurst	USEPA	2001	Removal of contaminated bed load from Pine Creek in Pinehurst was conducted to help reduce the potential for flooding that would recontaminate remediated areas in Pinehurst.	Volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
West Gate Contractor Staging Area	USEPA	2001 - 2002	This project is considered an extension of the Government Gulch and the south of I-90 Smelterville Flats remedial actions. It consisted of grading and capping the old "MK Town" area with 6 inches of gravel, and established a trailer court area for contractor use for overseeing remedial action in the area.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Operable Unit 3 (OU 3)					
Schlepp Agriculture to Wetland Conversion Project	USEPA/IDEQ	2006 - Present	USEPA is working collaboratively with a willing property owner, USFWS, and Ducks Unlimited to establish nearly 400 acres of clean feeding habitat for migratory and resident swans, ducks, and other wetland bird species. Significant numbers of waterfowl deaths have been recorded in the Basin for decades due to the lead contaminated sediment; this project will reduce waterfowl exposure to these contaminants by providing a safe wetland feeding area. Under the 2002 Interim ROD, using settlement monies EPA purchased a conservation easement from the property owner and is converting farmland to healthy wetland habitat. The project includes remediation of elevated soil metals, installation of water control structures and creation of drainage channels. After the cleanup is complete in 2010, the Coeur d'Alene Basin Natural Resource Trustees, led by the USFWS in coordination with Ducks Unlimited, will begin wetland restoration. The restoration will include control of exotic plants, planting native vegetation, and managing water levels to restore wetland habitat.	The volume removed is not yet available.	Schlepp Agriculture to Wetland Conversion; East Field Soil Lead Concentrations Technical Memorandum (CH2M HILL 2006a); Post-Remediation Subunit 7 Average Soil Lead Concentration; Schlepp Agriculture to Wetland Conversion, East Field Technical Memorandum (CH2M HILL 2007d); Schlepp Agriculture to Wetland Conversion; West Field Soil Lead Concentrations and Remedial Alternatives Technical Memorandum (CH2M HILL 2008)
Residential and Common Use Areas (Residential Yards)	IDEQ, USEPA, UMG	1997 - 2002	In 1997-2002, actions were completed at 119 residential yards. These actions included the partial removal of lead-contaminated soil and their replacement with clean soil or other protective barriers (e.g., clean gravel).	Volume removed was not recorded. Materials were placed in the Page Repository.	Second Five-Year Review (USEPA, 2005b)
Residential and Common Use Areas (Schools/Daycare Centers)	USEPA	1997 - 2001	Actions were completed at seven schools and daycares. The Silver Hills Middle School was started in 1997, and additional work was completed in 1998, 2001, and 2002 due to the extremely large property size. These actions included the partial removal of lead-contaminated soil and replacement with clean soil or other protective barriers (e.g., clean gravel).	Volume removed was not recorded. Materials were placed in the Page Repository.	Second Five-Year Review (USEPA, 2005b)
Residential and Common Use Areas (Private Drinking Water)	USEPA	1997 - 2002	Alternative water supplies were provided to 28 residences on contaminated private wells. Alternative supplies included bottled water for 11 homes, end-of-tap water treatment (water filters) for 5 homes, and municipal water hookup for 12 homes.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
South Fork Coeur d'Alene River					
South Fork Floodplain Removals	Silver Valley Natural Resources Trust (SVNRT)	1998	Non-time-critical removals were performed at several areas in the floodplain totaling about 128,000 cy of tailings and contaminated soil.	Approximately 128,000 cy of materials was removed.	Second Five-Year Review (USEPA, 2005b)

TABLE B2-2
Summary of Previous Remedial Actions in Upper Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Elizabeth Park Stream Bank Stabilization	SVNRT	1994 - 1995; 1999	This project removed 13,585 cy of tailings from the river and used the material to construct a compacted levee over 2,100 feet long on the south riverbank. In addition, 8,027 tons of riprap were placed on the riverbanks to protect them from further erosion. The project also installed in-channel stabilization, aquatic habitat features, and riparian zone enhancements. Work on the project was initiated in September 1994 and completed in May 1995. In 1999, additional river barbs were installed to enhance aquatic life.	13,585 cy of tailings were removed and used to construct a compacted levee.	Second Five-Year Review (USEPA, 2005b)
Trail of the Coeur d'Alenes					
Trail of the Coeur d'Alenes (UPRR Wallace-Mullan Branch ROW Removal Actions)	UPRR	2000 - 2004	UPRR conducted a removal action and established a recreational trail on the UPRR ROW in OU 3.	Removed and disposed of approximately 175,000 cy of mine-waste-contaminated materials.	Second Five-Year Review (USEPA, 2005b)
Big Creek					
Big Creek Repository	IDEQ, USEPA	2002 - Present	This project established a repository on a former Sunshine Mining Co. tailings pond for contaminated soil and other materials removed during implementation of the human health and ecological remedial actions.	No material was removed as part of this action. Approximately 106,000 cy of material had been placed in the BCR by 2004.	Second Five-Year Review (USEPA, 2005b); Phase I Remedial Action Assessment Report, OU 2 (CH2M HILL, 2007d)
Canyon Creek					
Canyon Creek (Standard Mammoth Facility)	Asarco	1997 - 1998	Removal of tailings with disposal at Woodland Park Repository was conducted. The site was also re-graded, stabilized, and capped, and the waste rock pile was revegetated. The railroad grade and crossing were removed.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
Canyon Creek from Tamarack to below Gem	SVNRT	1997 - 1998	At this site, the time-critical removal of ~127,000 cy of tailings and contaminated sediment, with disposal at the Woodland Park Repository, was conducted. Soil at removal areas was amended with organic materials and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques.	Approximately 127,000 cy of material was removed and placed in Woodland Park Repository.	Second Five-Year Review (USEPA, 2005b)
Lower Canyon Creek Floodplain	SVNRT	1997 - 1998	Time-critical removal of 472,000 cy of tailings and contaminated materials was performed, with disposal at the Woodland Park Repository. Soil at removal areas was amended with organic materials and then revegetated. The stream channel of Canyon Creek was stabilized with bioengineering techniques.	Approximately 472,000 cy of material was removed and placed in Woodland Park Repository.	Second Five-Year Review (USEPA, 2005b)
Woodland Park Repository	SVNRT	1997 - 1998	An unlined repository for disposal/consolidation of removals along Canyon Creek was constructed. The repository contains approximately 600,000 cy of contaminated materials. The repository was capped with native soil and revegetated.	No material was removed as part of this action. The WPR received approximately 600,000 cy of material.	Second Five-Year Review (USEPA, 2005b)
Gem Portal Pilot	Bureau of Land Management (BLM), SVNRT, USEPA	2000 - 2008	A pilot system was created by ASARCO (10 gallons per minute) for treatment of drainage from the Gem Portal. Evaluation of the Gem Portal Pilot Water Treatment System in the context of Canyon Creek water treatment continued until BLM removed the pilot system in 2008.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)

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Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Sisters Mine					
Sisters Mine	IDEQ, USEPA	2004 - 2005	In 2004, USEPA initiated the remedial design for this site for implementation by the State of Idaho during the summer of 2005. Remediation was completed in 2005.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Coeur d'Alene Mill					
Coeur d'Alene Mill	Coeur Silver Valley	2001 - Present	In 2001, the mill, located in McFerran Gulch, was demolished. Prior to demolition, all salvageable metal materials were removed, decontaminated, and taken offsite. The mill building was pulled apart using an excavator. A few large timbers were decontaminated and saved. The remainder of the demolition materials, primarily wood, was fed into a chipper, which reduced volume by 90 percent. Once the mill building was removed, the foundation and ore bins were cleaned. Fencing at the site was repaired and improved. Large boulders were placed at selected potential access points. Signs were placed at appropriate locations.	Approximately 1,130 cy of contaminated soil was removed. Contaminated materials were disposed at the Osburn Tailings Pond mine-waste repository.	Second Five-Year Review (USEPA, 2005b)
Grouse Creek					
Grouse Creek: We Like Mine	BLM	2001 - Present	The We Like Mine is in the upper part of Grouse Creek, just above the original Star Mine Rock Dump area. In 2001, the BLM started mine water investigations. In 2003, a pilot bioreactor tank water treatment system was installed and continues to operate.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Moon Creek					
Silver Crescent and Charles Dickens Mines	U.S. Forest Service	1998 - 2000	Non-time-critical removal of ~130,000 cy of tailings, waste rock, contaminated soil, and mill structures, with disposal at an onsite repository was performed. Four adits were closed. Stream relocation, revegetation, and structural rehabilitation were performed along approximately 3,300 feet of Moon Creek, in addition to 10 acres of riparian revegetation.	Approximately 130,000 cy of material was removed and placed in an onsite repository.	Second Five-Year Review (USEPA, 2005b)
Elk Creek Pond at Mouth of Moon Creek	SVNRT, USEPA	1994; 2000	Limited tailings removal was conducted in 1994. Clean sand was imported for a recreational beach at this swimming hole. Time-critical removal of 28,000 cy of contaminated sediments and tailings was conducted in 2000.	Approximately 28,000 cy of contaminated material was removed.	Second Five-Year Review (USEPA, 2005b)
Ninemile Creek					
Ninemile Creek Success Mine Site Passive Treatment	IDEQ, SVNRT, USEPA	2000 - Present	Contaminated groundwater was diverted by a subsurface grout wall (approximately 1,350 feet in length) to a treatment vault. Groundwater was treated using apatite. The pilot-scale apatite barrier system at Success Mine on the East Fork Ninemile Creek (EFNC, a drainage adjacent to Canyon Creek) has experienced considerable operational problems with plugging and low permeability, although concentrations of zinc and other metals have been low in the limited throughput achieved. The treatment system is currently not in operation.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b); Project Report for Success Mine Apatite Barrier Modification and Evaluation (Yancy, 2006).
Rex Mine and Mill	BLM, USEPA	2002 - 2007	Stabilization of a waste rock dump and a stream bypass around tailings were implemented by BLM. In 2004, USEPA initiated the remedial design for this site, which included the collection of pre-design data. In 2006 and 2007, remedial actions included removal of onsite debris, re-alignment of Rex Creek channel and lining with rip-rap, consolidation of source materials onsite and capping with clean materials, and regrading the surface to promote surface water runoff.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b); Draft Data Summary Report for the Coeur d'Alene Basin Remedial Action Monitoring Program (CH2M HILL, 2009b)
Interstate Tailings Removal	Hecla	1992 - 1993	Tailings were removed adjacent to EFNC, with consolidation to a nearby uphill area. Straw bales were installed along the perimeter of tailings for erosion control.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
Interstate Mill Site	IDEQ, SVNRT	1998	Non-time-critical removal of ~60,000 cy of tailings, mill debris, and contaminated sediments was performed from the mill site and from EFNC for 1,000 feet downstream. They were disposed of at an onsite repository. EFNC was stabilized with bioengineering structures in removal areas.	Approximately 60,000 cy of contaminated material was removed and disposed of onsite.	Second Five-Year Review (USEPA, 2005b)
Success Mine/Mill Tailings and Waste Rock	Hecla	1993	Time-critical removal action included relocation and riprap armoring for ~1,600 feet of EFNC channel, relocation of streamside tailings, placement of in-stream structures for energy dissipation, capping of tailings pile with 1-foot-thick overburden rock, and installation of upgradient groundwater and surface water diversions.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)

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Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
East Fork Ninemile Creek Floodplain	IDEQ, SVNRT	1994	Time-critical removal was performed for ~50,000 cy of floodplain tailings and contaminated sediments, with disposal at the Day Rock Repository. In addition, stream reconstruction, riparian stabilization, and revegetation were conducted.	Approximately 50,000 cy of material was removed and placed in the Day Rock Repository.	Second Five-Year Review (USEPA, 2005b)
Ninemile Creek Floodplain near Blackcloud	Hecla, IDEQ	1994	Remedial actions included the time-critical removal of ~44,000 cy of floodplain tailings and contaminated sediments, with disposal at the Day Rock Repository. Then stream reconstruction, riparian stabilization, and revegetation were performed.	Approximately 44,000 cy of material was removed and placed in the Day Rock Repository.	Second Five-Year Review (USEPA, 2005b)
Day Rock Repository	Hecla, IDEQ, SVNRT	1994	Approximately 94,000 cy of material from the floodplain removals was placed on top of the existing Day Rock Repository and capped with native soil and growth media.	No material was removed as part of this action. Approximately 94,000 cy of material from removal actions was placed in the Day Rock Repository.	Second Five-Year Review (USEPA, 2005b)
Pine Creek					
Pine Creek Constitution Mine and Mill Site	BLM	1998 - Present	Non-time-critical removal actions included the removal of contaminated soil around the mill, with disposal at the CIA, and realignment of East Fork Pine Creek away from the toe of the tailings pile. Most of the tailings and waste rock dump are on private land and have not been addressed to date. In 2002 at the Upper Constitution Site, the BLM installed a pilot mine water treatment bioreactor unit and a groundwater drain above the upper tailings pile. In 2003, the BLM modified the system and installed a groundwater drain above the bioreactor.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
Pine Creek Constitution Mine and Mill Site	USEPA	2006	Source materials from the lower segment were relocated and consolidated to the upper segment. Both upper and lower segments were hydro-seeded and revegetated. Surface water controls were installed to control onsite runoff and erosion to East Fork Pine Creek.	The volume removed was not recorded.	Draft Data Summary Report for the Coeur d'Alene Basin Remedial Action Monitoring Program (CH2M HILL, September 2009)
Denver Creek (includes Little Pittsburg, Hilarity, Denver, and Sydney Mine)	BLM	1996 - 2000, 2002	Time-critical removal was performed for ~5,200 cy of tailings and contaminated soil associated with the Little Pittsburg Mill. No actions have been conducted on the private portion of the pile. The mouth of Denver Creek has been undergoing stabilization and revegetation by the BLM. Re-grading at the Sydney Mine was performed by the mine owner, Mascot Mining, in 2002.	Approximately 5,200 cy of contaminated material was removed.	Second Five-Year Review (USEPA, 2005b)
Douglas Mine and Mill Site	USEPA	1996 - 1997	This effort included the time-critical removal of two existing tailings impoundments from the floodplain of East Fork Pine Creek. 25,000 cy of contaminated material was removed and placed into a temporary repository constructed east of Pine Creek Road near the mine.	Approximately 25,000 cy of contaminated material was removed.	Second Five-Year Review (USEPA, 2005b)
Highland Creek Floodplain	BLM	1999	Time-critical removal of 8,100 cy of major discrete tailings deposits was performed along Highland Creek on public lands.	Removed approximately 8,100 cy of contaminated material.	Second Five-Year Review (USEPA, 2005b)
Highland-Surprise Mine/Mill Site (Includes Nevada Stewart Mine)	BLM	1999	Highland Creek was diverted to reduce erosion of the lower waste rock dump. Most of the facilities at this site are on private land, thus no other actions have been taken to date. In 2001 and 2002, the BLM regraded the upper and lower rock dumps at Highland Surprise. Along with that effort in 2002, the BLM also regraded the Nevada Stewart rock dump.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)

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Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Pine Creek Sidney (Red Cloud) Mine/Mill Site	BLM	1997 - Present	Activities performed include non-time-critical removal of contaminated soil around the mill foundations, with disposal at the CIA; run-on and runoff controls; and improvements to the upstream culvert on Red Cloud Creek to control flow through the site and reduce downstream erosion. Passive treatment of adit drainage with inflow prevention at the Sidney Shaft in Denver Creek was conducted. The rock dump was re-graded and hydroseeded in 2000 to minimize erosion. Additional stream channel work at the toe of the dump was performed in 2002. In 2001, the BLM started pilot water treatment efforts with the Sidney Red Cloud tunnel mine discharge. In 2003, a pilot bioreactor water treatment system was installed and continues to be operated and monitored.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
Amy-Matchless Mill Site	BLM	1996 - 2000	Time-critical removal of ~9,600 cy of tailings and contaminated soil was conducted in 1996 and 1997. In 1998, a non-time-critical removal action removed an additional 420 cy of residual tailings. The disturbed area was covered with soil and revegetated. The mine adit was closed by backfilling. In addition, the waste rock dump was regraded and revegetated.	Approximately 10,020 cy of contaminated material was removed.	Second Five-Year Review (USEPA, 2005b)
Liberal King Mine/Mill Site	BLM	1996 - 2000	This effort included the time-critical removal of ~9,400 cy of tailings and contaminated soil. In 1998, 99 cy of mill site tailings and mill wastes were removed from the mill area. In 1999, non-time-critical removal was performed for an additional 1,800 cy of tailings, followed by regrading backfill of a dry adit, import of growth medium, and revegetation. The 2000 actions included extensive grading and planting of riparian vegetation. There are continuing efforts to further revegetate and stabilize the stream reach with additional stream work and plantings of shrubs and trees.	Approximately 11,300 cy of contaminated material was removed.	Second Five-Year Review (USEPA, 2005b)
Nabob Mine/Mill Site	BLM	1994 - 2000, 2001	This remedial action included soil cover installed to limit access to the mill site and tailings, and channel improvements along Nabob Creek to stabilize the channel and prevent erosion of the tailings pile embankment. In 1995, the mine operator seeded and placed soil cover materials over the tailings, but the success of the revegetation is limited. In 2000 the BLM started an investigation at the site, drilling 20 wells around the pile and mill. Also in 2000, the BLM installed a groundwater cutoff drain above and along the side of the tailings pile. In 2001, the BLM regraded the Nabob mid-level rock dump.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Upper South Fork Coeur d'Alene River					
Morning Mine No. 6	Hecla	1989; 2000	Adit drainage was directed to subsurface flow with a rock-bed filter treatment system. Slaughterhouse Gulch was lined to reduce infiltration through the waste rock pile.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Osburn Flats	SVNRT	1997 - 1998	This project included the removal of 133,000 cy of tailings and contaminated soil. The project also tested the application of various in situ treatments to tie up metals.	Approximately 133,000 cy of contaminated material was removed.	Second Five-Year Review (USEPA, 2005b)
Golconda Site	IDEQ, USEPA	2004 - 2007	In 2004, USEPA initiated the remedial design for this site for implementation of an interim action by the State of Idaho during the summer of 2005. In 2006, design and construction were completed for a water diversion structure to route water through pipes from the site and mine adit (away from existing tailings) and route them to the South Fork Coeur d'Alene River (SCFDR). In 2007, source materials nearest the SFCDR were moved to an upland area, capped with clean materials, and re-seeded. Armoring was placed along the base of the waste rock pile and along the SFCDR.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
Lower Coeur d'Alene River					
Cataldo Mission	Coeur d'Alene Tribe	1995	Approximately 700 cy of tailings and contaminated soils were removed from traditional campground areas in the vicinity of the Cataldo Mission.	Approximately 700 cy of contaminated material were removed.	Second Five-Year Review (USEPA, 2005b)
Cataldo Boat Ramp	IDEQ	1996 - 1997	Placement of cabled-log bank protection and brush wattling was conducted to reduce erosion, and planting of bushes in the vicinity of contaminated soils was performed to discourage human contact with the soils.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Black Rock Slough Trailhead/Highway 3 Crossing	USEPA	2001 - 2002	This project graded and capped access road and parking area for a trail providing access to Trail of the Coeur d'Alenes, and conducted stabilization of 125 feet of eroding river bank.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Killarney Lake Boat Launch	BLM	1991 - 1998	The project covered contaminated shoreline with geotextile fabric overlain with 12-inch rock, paved the floodplain area and road, covered edge areas with topsoil and sodded grass, rebuilt a concrete plank boat launch and provided drinking well and vaulted toilets at the site.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)

TABLE B2-2

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Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Site Name/ Project Name	Implementing Party	Dates	Description	Material Removed	Reference
Dudley Bank Stabilization	SVNRT	1999	This was a pilot bank erosion project to evaluate effectiveness of rock berms in reducing bank erosion caused by piping or by undercutting from boat wakes. The project berms were constructed along 625 feet of the south bank and 720 feet of the north bank of the Lower Coeur d'Alene River, upstream from the Dudley Landing. The berms were constructed with large rocks placed on a geotextile fabric to prevent fine-grained soil from being washed out and undermining the berms. The berms were about 2 feet wide and were placed from 7 to 30 feet from the top of the riverbank. Monitoring in late 2000 found that very little bank erosion had occurred and the berms have remained stable.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Medimont Bank Stabilization	SVNRT	1999	Four types of bank erosion control were placed, two with hay bales and two with riprap. Subsequent monitoring indicated that the hay-bale methods were not effective in this portion of the river.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Highway 3/Trail of the Coeur d'Alenes Crossing	USEPA	2003 - 2004	This project capped contaminated soil adjacent to a previously remediated parking area with a combination of pavement and a topsoil/fabric/grass to block exposure to contaminated soil and create a safe picnic area for trail users.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Medimont and Rainy Hill Boat Launches	ASARCO, Hecla	1999	Approximately 1,000 cy of clean aggregate capped contaminated parking and access areas, 3- to 6-inch rock was placed in shallow areas to discourage children from playing in contaminated sediments, and boulders were placed to control traffic.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Thompson Lake Boat Launch	USEPA	1999 - 2000	Contaminated sediment was removed from the shoreline, and geotextile fabric was placed against the bank and overlain with 12-inch rock. An existing unpaved parking lot was rebuilt and capped with asphalt; concrete planks were installed to provide a boat launch.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
Anderson Lake Boat Launch	USEPA	1999	Contaminated sediment was removed from the shoreline, and geotextile fabric was placed against the bank and overlain with 12-inch rock. An existing unpaved parking lot was rebuilt and capped with asphalt; concrete planks were installed to provide a boat launch.	The volume removed was not recorded.	Second Five-Year Review (USEPA, 2005b)
East of Rose Lake Boat Launch	USEPA, USFS	2003 - 2004	This project placed a cap on a contaminated soil parking lot, performed bank stabilization near a boat launch, closed off previous access road and replaced it with a safer access road, revegetated, and installed protective fencing around a historic building on the property.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Silver Dollar Growth Media Project					
Silver Dollar Growth Media Project	IDEQ	2002 - Present	Evaluation of the Growth Media Pilot Project is ongoing.	No material was removed as part of this action.	Second Five-Year Review (USEPA, 2005b)
Silver Summit Mill					
Silver Summit Mill	Sunshine Mining Company	2001	The Sunshine Mining Company labeled and removed all containers of solvents, lubricants, processing chemicals, paint, and trash. A polychlorinated biphenyls (PCBs) investigation was conducted for all transformers and oil switches located throughout the site, and none were found. Access controls were established.	No material was excavated during this action. Containerized materials were removed from the site.	Second Five-Year Review (USEPA, 2005b)

TABLE B2-3
Summary of Previous Studies in Upper Basin, 2001 to 2008
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Bunker Creek						
Bunker Creek	Bunker Creek Pilot Study	U.S. Environmental Protection Agency (USEPA)	2008	The purposes of the Bunker Creek Pilot Study were to collect data required (1) to evaluate the effectiveness of a potential Phase II remedial action (i.e., lining Bunker Creek) towards improving water quality, and (2) for Bunker Creek remedial design. The Bunker Creek Pilot Study focused on simulating conditions in the Bunker Creek area that would be anticipated to occur if the Bunker Creek channel were lined.	During the study, it became apparent that it would not be possible to conduct the pilot study for a sufficient amount of time for the relatively large hydrologic system in the area to reach steady-state conditions. Therefore, the purpose became collecting the data necessary to evaluate the effectiveness of the remedial action (i.e., lining Bunker Creek) using a transient numerical groundwater flow model to estimate conditions at steady state. A more in-depth evaluation of the potential water quantity and quality impacts resulting from lining the Bunker Creek channel will be presented in future documents that will detail the groundwater modeling results, predicted water quality impacts, and remedial action alternatives analyses. Key findings of data collection: • The diversion of the Central Treatment Plant (CTP) effluent from Bunker Creek resulted in no discharge being present in Bunker Creek from the CTP outfall downgradient to approximately 500 feet above the confluence with Magnet Gulch. The discharge measured in Bunker Creek below Magnet Gulch was predominantly from the A-4 Gypsum Pond French drain in Magnet Gulch. • Elevated metals detected in Bunker Creek channel sediments likely serve as the source of dissolved metals contamination to the underlying alluvial aquifer when infiltration of surface water occurs. • Dissolved metals concentrations significantly increased from Monitoring Station BH-MG-0001 to the mouth of Magnet Gulch at Bunker Creek, likely from contaminated groundwater from the French drain at the toe of the A-4 Gypsum Pond. Dissolved metals from Magnet Gulch may be the largest source of dissolved metals in Bunker Creek surface water under low-flow conditions. • The simulated lining of Bunker Creek did not hydrologically affect the shallow alluvial aquifer. • The simulated lining of Bunker Creek did not appear to affect dissolved metals concentrations in groundwater. • Hardness declined in groundwater in the Bunker Creek corridor, potentially indicating (1) the losing sections of Bunker Creek and (2) groundwater flow pathways from the Bunker Creek corridor to the South Fork Coeur d'Alene Basin (SFCDR). The change in hardness may also be indicative of large-scale processes within the aquifer. • Dissolved cadmium and dissolved zinc concentrations measured from the three SFCDR monitoring stations appeared unaffected by the Bunker Creek lining simulation, while dissolved lead concentrations declined.	Bunker Creek Pilot Study Summary Tech. Memo. (CH2M HILL, 2009b)
Canyon Creek						
Canyon Creek	Canyon Creek Hydrologic Study	USEPA	2006	This study was designed to gain a better understanding of the hydrologic system within Canyon Creek from 2006-2007. The study encompassed stream stage installation, aquifer testing, groundwater sampling, groundwater flow modeling, and remedial action strategy evaluations.	To improve the understanding of the hydrogeologic conditions of the Canyon Creek area, additional monitoring wells and stream stage gauging devices were installed to collect information regarding groundwater levels, aquifer properties, horizontal and vertical hydraulic gradients, the extent of surface water/groundwater interaction, and the spatial distribution of groundwater quality. From this information, a groundwater modeling tool was developed for the site and used to evaluate the reduction in metals loading to Canyon Creek that would be achieved by implementation of various water management options. These treatment options generally fell into three categories: passive water collection, active water collection, and passive water collection with stream lining. Fifteen simulations with different treatment options were made. Those that resulted in the greatest simulated reduction to the zinc loading of Canyon Creek were Creek Lining A1-A6; French Drain A1-A6 with A1 & A6 Cut-offs (High Flow); French Drain A1-A6 with A6 Cut-off (High Flow); and French Drain A2-A6 with A6 Cut-off (High Flow).	Canyon Creek Hydrologic Study Report (CH2M HILL, 2007a)

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Summary of Previous Studies in Upper Basin, 2001 to 2008
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Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Canyon Creek	Canyon Creek Water Treatment Technology Evaluation	USEPA	2005	This memorandum summarizes water treatment work to date for Canyon Creek and provides recommendations for future treatability testing.	Only technologies appropriate for the low-flow/high-concentration scenario are recommended for evaluation in the Phase II Treatability Study, because this scenario represents the most promising approach for achieving the Record of Decision (ROD) benchmark in the most cost-effective manner. Technologies proposed for testing as part of the Phase II Treatability Study include *ex situ* reactive media (limestone, dolomite, brucite, periclase, di-calcium silicate, and possibly others), an *ex situ* sulfate-reducing bioreactor (SRB), and the high-density sludge (HDS) process. Data gaps related to surface water/groundwater interactions at the site remain, and there is some uncertainty as to the corresponding reduction in dissolved metals concentrations in surface water that would be achieved by treating nearby groundwater.	Canyon Creek Water Treatment Technology Evaluation Tech. Memo. (CH2M HILL, April 1, 2005)
Canyon Creek	Canyon Creek Groundwater Metal Source Characterization	Idaho National Laboratory (INL)	2006	This document presents the findings of the metal speciation study conducted in Canyon Creek. The purpose of this study was to develop the capability to predict leaching rates from Canyon Creek alluvium.	This project was designed as a preliminary study of metal speciation in and metal releases from Canyon Creek sediments in an effort to help understand the factors that affect metal mobility (with focus on zinc, cadmium, and lead). Three groups of experiments were conducted: (1) sequential extraction tests to determine the operational speciation of the metals in the sediment, (2) leaching tests to determine the rate of release of metals under various chemical conditions, and (3) column leaching tests to provide insight into the time scales for removal of the metals from the sediments. • Results of the sequential extraction tests showed that approximately 40 percent of the Zn, Cd, and Pb removed during the sequential extractions came from fractions considered easily leached, 20 percent from fractions considered very difficult to leach, and the remaining 40 percent from fractions for which leachability depends on the pH of the system. • Leaching tests were conducted to determine how ionic strength and pH affected the rates of leaching and the concentration of leached metals. The concentrations of Zn, Cd, and Pb were fairly constant during the time period of the extraction experiments. The leaching rate of Pb and Zn appeared to decrease over time, while Cd appeared to increase over time. • The column was operated for 41 days, over which time the concentrations of Zn, Cd, and Pb declined monotonically by more than a factor of 10. Study recommendations are to (1) determine the spatial variability of metal fractions in the alluvium, (2) develop better measurements and models for groundwater/surface water interactions, and (3) establish a sound conceptual/quantitative model for the groundwater hydrology.	Canyon Creek Groundwater Metal Source Characterization (INL, 2006)
Canyon Creek	Canyon Creek Lime Neutralization Pilot Study	Rust	2003 - 2006	Rust's August 2003 memo described treatment of Canyon Creek water by conventional lime neutralization followed by settling ponds. Clean Water Act (CWA) funding was obtained to prepare the design of a pilot-scale system.	Pioneer Technical Services (Pioneer) has been contracted to prepare a pilot-scale design of the system. The design is composed of three treatment cells, the first two with 2 days of retention time, and the third with 3 days of retention time. The design flow rate to the system is 300 gallons per minute (gpm). The total pilot system area is 15 acres. System effluent is discharged through infiltration. Due to funding uncertainties, the schedule for this study is not known at this time.	Memorandum to the Water Treatment Project Focus Team (Rust, 2003); Canyon Creek Pilot-Scale Lime Lagoon Treatment System, Presentation to the Water Treatment Project Focus Team (Pioneer, 2006); and 100% Coneptual Design for the Canyon Creek Pilot-Scale Lime Lagoon Treatment System (Pioneer, 2007).

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Summary of Previous Studies in Upper Basin, 2001 to 2008
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Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Canyon Creek	Canyon Creek Preliminary Design Data Review	USEPA	2006	This memorandum summarizes historical analytical data collected from the lower Canyon Creek drainage area and outlines pertinent aspects of the data set. Collected data have been categorized and incorporated into a database and will be used to support the development of the remedial design for Canyon Creek.	This memorandum summarizes the data sources available for the following matrices: groundwater; surface water; surface soil; subsurface soil; sediment; and rock, gravel, and cobbles.	Canyon Creek Preliminary Design Data Review Tech. Memo.(CH2M HILL, 2006d)
Canyon Creek Gem Portal Pilot	Gem Portal Pilot Study	Bureau of Land Management (BLM), Silver Valley Natural Resources Trust (SVNRT), USEPA	2000 - 2008	A pilot system was created by Asarco (10 gpm) for treatment of drainage from the Gem Portal. Evaluation of the Gem Portal Pilot Water Treatment System in the context of Canyon Creek water treatment continued until BLM removed the pilot system in 2008. This report presents the findings of pilot-and bench-scale water treatment tests conducted at the Gem Portal drainage. The treatment systems included a pilot-scale anaerobic biological treatment system, a bench-scale lime precipitation system, and a pilot-scale floating sand filter.	The treatment systems tested did not achieve the degree of metals removal needed to meet water quality discharge objectives in the effluent.	Engineering Evaluation/Cost Analysis for the Gem Portal Drainage (Asarco, 2004)
Canyon Creek Water Treatment Pilot Study	Phase I Pilot Test	USEPA	2004	Bench-scale testing was conducted to evaluate the effectiveness of lime addition for metal precipitation in various combinations with pH adjustment and addition of iron coagulants for iron co-precipitation. Solids/liquid separation testing was also conducted on the resulting solution using flocculants and ballasted microsand.	The results of the study confirmed that lime addition is effective for precipitation of metals.	Canyon Creek Treatability Study Phase I Report (URS, 2005)
Canyon Creek Water Treatment Pilot Study	Canyon Creek Phase II Water Treatment Pilot Test	USEPA	2005 - 2006	The Canyon Creek Phase II treatability study consisted of two main components. The first component was a laboratory screening of reactive media bed (RMB) and SRB treatment of Canyon Creek groundwater. The second component was a field pilot test of HDS treatment of Canyon Creek Groundwater, HDS treatment of Canyon Creek groundwater combined with Bunker Hill Mine water, and SRB treatment of Canyon Creek groundwater (using two different SRB media mixtures). The laboratory screening indicated that the RMB technology did not produce favorable results. The SRB results were favorable, and continued in the pilot study. The pilot test resulted in favorable results using the HDS treatment. Based on pilot test results, larger, longer-term pilot testing of the SRB treatment is recommended.	The HDS-A1 pilot plant, treating Canyon Creek groundwater only, developed a moderately dense sludge, but the percent solids concentration was limited by the relatively low concentrations of influent metals (compared to other HDS systems). The system reached an equilibrium sludge concentration of 10 to 12 percent solids at final dilution within about 2 weeks of operation. While this percent solids level is low compared to other HDS plants, it is considerably higher than in conventional lime neutralization systems (typically ~1 to 3 percent solids) and, therefore, represents a marked reduction in waste sludge volumes generated compared to that type of process. The modest difference between the percent solids of thickener underflow and sludge at final dilution, as well as the major amount of amorphous material found by x-ray diffraction (XRD) analysis, suggest that the HDS-A1 sludge was only partially characteristic of true high-density sludge.	Canyon Creek Phase II Treatability Study Draft Report (CH2M HILL, 2006c)

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Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
					The HDS-B pilot plant, treating a combination of Canyon Creek groundwater and Bunker hill AMD (in a 2:1 volume ratio), developed dense sludge within 1 week of operation. The equilibrium sludge solids was about 25 percent at final dilution. The relatively large difference between the percent solids of thickener underflow and at final dilution indicates the more free-draining nature typical of high density sludge. The major amount of poorly crystalline material found via XRD analysis of HDS-B sludge provided additional evidence of high density sludge characteristics. Both HDS-A1 and HDS-B achieved high removal efficiencies for dissolved Zn and Cd (>99 percent). The HDS-B pilot results indicate that treatment of Canyon Creek groudwater in conjunction with Bunker hill AMD at the CTP is feasible.	
Upper Basin						
OU 3 Remedial Investigation	OU 3 Remedial Investigation	USEPA	2001	The Remedial Investigation (RI) Report provides detailed discussion of geologic and hydrogeologic conditions, the nature and extent of contamination, and fate and transport processes. The probabilistic model is introduced and used to estimate discharges of metals from tributaries to the SFCDR. An initial conceptual site model (CSM) for the watershed was developed from the RI. Source areas are identified and characterized.	Beginning in 1997, USEPA collected samples of soil, sediment, groundwater, surface water, and other environmental media (e.g., indoor dust, lead-based paint, and garden produce) as part of the RI. To guide field sampling efforts, a generic Field Sampling Plan and Quality Assurance Project Plan were prepared that included descriptions of methods that would be used to collect and analyze samples, conduct field measurements, and manage data. More than 10,000 samples were collected to support the RI. These samples, combined with the 7,000 additional samples collected independently by The Idaho Department of Environmental Quality (IDEQ), the U.S. Geological Survey (USGS), the mining companies, USEPA under other regulatory programs (e.g., the National Pollutant Discharge Elimination System [NPDES] program, 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.	Remedial Investigation Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study (USEPA, 2001c)
OU 3 Feasibility Study	OU 3 Feasibility Study	USEPA	2001	The Feasibility Study (FS) Report identifies and screens remedial alternatives based on criteria from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). A description of how each alternative would be implemented is provided. The FS also provides estimates of pre- and post-remediation mass loadings from watersheds within the Upper Basin that were developed using the probabilistic model.	Human health alternatives were developed for residential and community areas of the Upper and Lower Basins. Sets of alternatives were developed for each of the primary potential exposure medium: • Soil: (1) No Action, (2) Information and Intervention, (3) Information and Intervention and Access Modifications, (4) Information and Intervention and Partial Removal and Barriers, and (5) Information and Intervention and Complete Removal. • Drinking Water: (1) No Action, (2) Public Information, (3) Public Information and Residential Treatment, (4) Public Information and Alternative Source, (5) Public Information and Alternative Source, Groundwater, and (6) Public Information and Multiple Alternative Sources. • House Dust: (1) No Action, (2) Information and Intervention and Vacuum Loan Program/Dust Mats, and (3) Information and Intervention, Vacuum Loan Program/Dust Mats, Interior Source Removal, and Capping/More Extensive Cleaning. • Aquatic Food Sources: (1) No Action, (2) Information and Intervention, and (3) Information and Intervention and Monitoring.	Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study (USEPA, 2001d)

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Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
					For the development of ecological alternatives, the affected media retained are soil, sediment, and surface water. Groundwater is not a medium for direct exposure to ecological receptors; however, it is an important pathway for the migration of metals from soil and sediment to surface water, and was retained as a pathway throughout the FS analysis. Six ecological alternatives were developed for remediation of the Upper and Lower Basins: • 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	
OU 2/OU 3 Focused Feasibility Study	OU 2/OU 3 Focused Feasibility Study	USEPA	2009	The Focused Feasibility Study (FFS) Report proproses a comprehensive approach for addressing surface water contamination in the Upper Basin that will benefit human and ecological receptors. The FFS builds upon analyses presented in the 2001 FS Report. Alternatives were developed for a comprehensive Upper Basin surface water remedy. In addition, a second set of alternatives, refered to as "Remedy Protection" alternatives were developed for enhancement to existing Human Health Remedies within the Upper Basin.		Focused Feasibility Study Report, Upper Basin of the Coeur d'Alene River (USEPA, 2010)
OU 3 Groundwater and Surface Water Interaction	Dissolved Cadmium, Zinc and Lead Loads from Ground-Water Seepage into the South Fork Coeur d'Alene River System	USGS	1999	The seepage study described and quantified changes in stream flow and metals loading from groundwater in the drainages of the SFCDR. This study provides key hydrogeologic information for watersheds within the Upper Basin.	The Barton study described and quantified changes in stream flow and metals loading from groundwater in the South Fork Coeur d'Alene River system. This study provides key hydrogeologic information, including identification of gaining and losing reaches, for lower Canyon Creek and the SFCDR near Osburn, and quantification of the mass loading associated with each. The study focused on three stream reaches: a 3.3-mile reach of Canyon Creek near Woodland Park, a 4.8-mile reach of the SFCDR near Osburn, and a 6.5-mile reach of the SFCDR near Kellogg. During the July, September, and October seepage studies, gains in zinc and cadmium loads to the three reaches were predominantly from groundwater seepage. Following are additional conclusions: • The overall average gain in dissolved zinc from groundwater seepage to the SFCDR near Kellogg was 730 pounds per day (lb/day). • The net gains in dissolved zinc from groundwater seepage to Canyon Creek near Woodland Park and the SFCDR near Osburn were 150 and 218 lb/day, respectively. • The gain in dissolved cadmium load into the three reaches from groundwater seepage was about two orders of magnitude less than the increase in dissolved zinc. • Canyon Creek at Woodland Park was the only study reach where groundwater seepage contributed to dissolved lead load (a gain of 1.5 lb/day). Dissolved zinc concentration and stream discharge data collected during this study were downloaded from the U.S. Geological Survey website and incorporated into the Upper Basin database.	Dissolved Cadmium, Zinc, and Lead Loads from Ground-Water Seepage into the South Fork Coeur d'Alene River System, 1999 (Barton, 2002)

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Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Soil Amendment Study	Soil Amendment Study	IDEQ, USEPA, U.S. Fish and Wildlife Service (USFWS)	2001 - 2004	This is a two-pronged collaborative study using both laboratory and field studies to evaluate effectiveness of phosphate-based soil amendments to reduce the bioavailability and leachability of heavy metals.	The field leachability study was implemented by IDEQ. In the study, four 20-foot by 20-foot plots were established at both Black Rock Slough and Bull Run Lake. The plots at each site were subjected to the following applications: amendment with fishbone apatite (ground fish bone); amendment with liquid phosphate fertilizer (phosphoric acid), calcium carbonate, and potassium chloride; amendment with calcium carbonate/lime; and an unaltered control. The soil and pore water or shallow groundwater was sampled by IDEQ for 16 months to assess how the amendments affected the soil and pore water chemistry under field conditions. The pore water analyses and soil leaching data indicate the following chemical changes: • Phosphate amendments reduce the leaching of lead from soil using the toxicity characteristic leaching procedure (TCLP) extraction method; • Because the lime did not completely neutralize the acidity of the phosphate amendment, a short-term increase in soluble cadmium and zinc pore water concentrations was observed; • The amendments caused a short-term increase in soluble arsenic in the treated soils, while arsenic concentrations in pore water returned to pretreatment levels; and • Soluble phosphorus did not increase in soils treated with fishbone apatite but did show an increase in soils treated with liquid phosphate fertilizer, which appears to be decreasing with time. This may be related to the form in which the phosphate was added (e.g., liquid vs. solid). Further study is needed to resolve questions concerning optimal application rates, long-term stability, ecological impacts, and potential seasonal effects. Evaluate findings of follow-up study and, as appropriate, conduct further evaluations of technical feasibility of soil amendments.	OU 2 Second Five-Year Review (USEPA, 2005b)
Upper Basin, South Fork Coeur d'Alene River	2008 High-Flow and Low-Flow Surface Water Study Report	USEPA	2008	The primary purpose of the 2008 High-Flow and Low-Flow Surface Water Study was to conduct surface water quality monitoring during seasonal high-flow and low-flow conditions in order to characterize impacts on surface water quality, and to determine the relative contribution from major contaminant source areas identified in the RI Report (see above). Surface water monitoring stations were situated upstream and downstream from the source areas, adits, and tailings pile seeps. The data sets collected during this study also provided current information to help with the prioritization of sites for remedial action in OU 3.	The high-flow and low-flow surface water study primarily focused on stations along Ninemile Creek and Canyon Creek, and also monitored select stations along the main stem of the SFCDR between Elizabeth Park and Mullan, Idaho. The difference in loading between the upstream and downstream stations for a given stream “reach” was calculated as the net gain or loss from all sources in-between, including the stream bed and the alluvium itself. In some stream reaches, a specific source was identified. In other cases, the net loading contribution was attributed to all sources in-between the upstream and downstream stations. Conclusions from this study include: • East Fork Ninemile Creek: Both dissolved zinc and total lead experienced similar patterns of loading. During high-flow conditions, the primary source of loading was from below the Success Reach, with reduced contributions from the Interstate Millsite Reach. During low-flow conditions, the primary source was the Success Reach. Net loading was found for both dissolved zinc and total lead. • Ninemile Creek: The primary contribution of dissolved zinc and total lead was from the East Fork of Ninemile Creek during high flow and low flow. There was a net loss of zinc and lead within the Dayrock Mine Reach for at both flow stages. • Canyon Creek: During high-flow and low-flow conditions, loading of dissolved zinc was primarily from the Woodland Park Reach and the Standard-Mammoth Mine Complex Reach. During high- and low-flow conditions, loading of total lead was highest from the Standard-Mammoth Mine Complex Reach. • South Fork Coeur d'Alene River: For zinc, loading under both flow conditions was highest from Canyon Creek. A net loss was measured between Wallace and the River Station SF-239. Total lead loading was highest from Ninemile Creek during high flow, but under low-flow conditions, Canyon Creek dominated loading. A net loss was also measured for total lead within the same stretch from Wallace to Station SF-239.	Draft 2008 High-Flow and Low-Flow Surface Water Study Report, Upper Basin of the South Fork Coeur d'Alene River (CH2M HILL, 2009f)

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Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Upper Basin, South Fork Coeur d'Alene River	Groundwater Monitoring Report Upper Basin Field Studies	USEPA	2008	This report presents procedures, field activities, and results for groundwater data from both May and October 2008 sampling in order to support the CSM and groundwater flow model.	Groundwater elevations were measured in May 2008 to assess groundwater table conditions during the spring snowmelt and high-flow surface water conditions in Canyon Creek, including Woodland Park and Ninemile Creek. Groundwater elevations were measured in October 2008 to assess groundwater table conditions during the dry season and low-flow surface water conditions. The 2008 groundwater monitoring activities were implemented as planned and provided valuable groundwater quality and elevation data with which to evaluate potential impacts of metals-laden groundwater on surface water throughout the Upper Basin. Collected data will be used to refine the CSM and support development of the numerical groundwater flow model of the SFCDR watershed and the subsequent evaluation of remedial options.	Upper Basin Field Studies, Phase 1 and 2 Investigations, Draft Groundwater Monitoring Report (CH2M HILL, 2009h)
Bunker Hill South Fork of the Coeur d'Alene River and Tributaries)	OU 2 Groundwater-Surface Water Interaction Monitoring	USEPA	1999; 2003; 2006; 2007; and 2008	The first groundwater-surface water interaction study in OU 2 was conducted in 1999 by USGS. This study was replicated by CH2M HILL in 2003. In 2006, the study became part of the OU 2 EMP and has been repeated in 2006, 2007, and 2008. This study is intended to assess the contribution of metals loading from groundwater into receiving surface water in the area, and identify source areas.	The key findings below are based on the results of the 2008 study. This 3-day study was conducted during a hydrologic period when the SFCDR discharge was not stable. The key findings below are based mostly on data collected during the third day of the study, and include: • Evaluation of discharge data collected during the 2008 study indicated that the location of the transition between gaining and losing reaches in the western portion of OU 2 have changed. • Specific conductance profiles collected at SFCDR monitoring locations show lateral variations in specific conductance across the stream profile at Stations BH-SF-LF-0004, BH-SF-LF-0005, and BH-SF-LF-0006. All other stations show little or no change in specific conductance across the channel profile. This lateral stratification of specific conductance at these locations is likely the result of contaminated groundwater discharging to the SFCDR along the southern bank in this gaining reach of the SFCDR. • pH measured at SFCDR monitoring locations was generally lower in gaining reaches in the SFCDR and higher in losing reaches. • Dissolved cadmium and dissolved zinc concentrations in the SFCDR consistently increased in gaining reaches and decreased in losing reaches of the SFCDR, consistent with the discharge of groundwater with elevated concentrations to the SFCDR. • Dissolved lead concentrations in the SFCDR were relatively consistent within OU 2. • Total phosphorus, sulfate, dissolved iron, and dissolved manganese concentrations in the SFCDR increased substantially in the gaining reaches of the SFCDR. • The greatest loads of dissolved cadmium and dissolved zinc to the SFCDR from groundwater occurred in the gaining reach of the SFCDR in the eastern portion of OU 2, between monitoring locations BH-SF-LF-0003 and BH-SF-LF-0006. • Dissolved lead loads were highly variable and resulted in an overall negative load balance. This is a result of the geochemistry of lead in OU 2 surface water and groundwater. The highest load of dissolved lead was from Milo Creek. • AWQC ratios for dissolved cadmium and dissolved zinc exhibited their greatest increase in the gaining reach of the SFCDR in eastern OU 2. AWQC ratios for dissolved lead in the SFCDR and measured tributaries were consistently below 1 with the exception of Milo Creek (AWQC ratio = 15).	Dissolved Cadmium, Zinc, and Lead Loads from Ground-Water Seepage into the South Fork Coeur d'Alene River System, 1999 (Barton, 2002). Additional references to be added for final report.

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Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
Osburn Flats	Osburn Flats Groundwater-Surface Water Interaction Study	USEPA	2008	This study is a summary of the groundwater/surface water interaction along the SFCDR near Osburn Flats. This study was intended to replicate a USGS study (Barton, 2002) that was performed in the Box. It assessed metals concentrations in groundwater seeping to surface water in this area, evaluated AWQC ratios, and identified source areas.	The groundwater-surface-water interaction study at the SFCDR at Osburn Flats was performed over 3 days. Conclusions from this study include: • The 3-day average of discharge measurements at each station and vertical hydraulic gradient (VHG) measurements indicates that the SFCDR is generally losing between Stations B-1Alt and B-3, gaining between B-3 and B-4, losing between B-5Alt and B-7, and gaining between B-7 and B-8. • Concentrations of both dissolved cadmium and zinc in surface water increased at each station from downstream (B-8) to upstream (B-1Alt). • Dissolved metal concentrations in the shallow streambed are generally higher in areas with upward VHGs, with the exception of Station B-5Alt. • Dissolved metal concentrations and load estimates from the 1999 study (diel-adjusted) are slightly lower than observed during the 2008 study. • Stream reaches around Stations B-3, B-4, and B-8 appear to be the predominant zones where groundwater inflow to the stream and contaminant loading is occurring. This conclusion is based on vertical hydraulic gradients, shallow streambed water chemistry, surface water chemistry, and data and observations from the B-4 seep and the surrounding area.	Osburn Flats Groundwater-Surface Water Interaction Study, Draft Technical Report (CH2M HILL, 2009g)
Osburn Flats	Osburn Flats Aquifer Testing Summary	USEPA	2008	Monitoring wells were installed in the Osburn area in October 2008. These were part of the hydrologic investigation in this area; this study summarizes aquifer testing and results.	Twelve aquifer tests were performed during this study. Four were single-well tests, and eight involved at least one monitoring well in an effort to investigate aquifer heterogeneity, aquifer anisotropy, and groundwater-surface water interaction. The following aquifer properties were determined: • Average transmissivity values for each location ranged from 22,000 to 85,000 square feet per day [ft2/day], with a median of 31,500 ft2/day. • Average hydraulic conductivity values ranged from 600 to 4,700 feet per day (ft/d) with a median of 1,300 ft/d. There were no apparent spatial trends in hydraulic conductivity distribution. These values and the lack of a spatial pattern (at the scale observed) are consistent with alluvial deposits of coarse sand and gravel. • Average storage coefficient values for each location ranged from 0.017 to 0.19, with a median value of 0.038. These values are consistent with unconfined to semi-confined alluvial systems.	Osburn Flats Aquifer Testing Summary, Upper Coeur d'Alene Basin Field Study, Draft Tech. Memo. (CH2M HILL, 2009j)
Osburn Flats	Osburn Flats Subsurface Exploration and Well Installation Summary	USEPA	2008	This study summarizes field work conducted in the Osburn Flats area, including the installation of wells, performed to support the CSM for the area.	A summary of hydrogeologic conditions determined through this study includes: • On the basis of conditions encountered in boreholes advanced during the September/October 2008 subsurface investigation, the subsurface in the Osburn Valley generally consists of about 30 to 50 feet of alluvium overlying argillite bedrock. The alluvial aquifer is unconfined, with depth to water ranging from about 5 to 20 feet. • The alluvial aquifer appears somewhat stratified. In general, the alluvium consists of poor to well-graded sand (10 to 25 percent) and gravel with varying concentrations of silt, clay, and cobbles (5 to 15 percent). However, the upper sequence of this alluvium generally contains fewer fines (less than 5 percent to 15 percent), with increasing amounts of silt and clay (15 to 25 percent) in the 5 to 10 feet above the argillite bedrock. • The upper few feet of bedrock were weathered and/or fractured. Beneath this weathered zone, the bedrock appeared dry, and the bedrock is not expected to be a significant source of groundwater. • Specific capacity (the ratio of pumping rate to drawdown) data are often used to estimate aquifer properties; however, these calculations and further analysis are reserved for the more robust aquifer testing data collected post-development. They will be included in the technical memorandum titled Osburn Flats Aquifer Testing Program.	Osburn Flats Subsurface Exploration and Well Installation Summary, Upper Coeur d' Alene Basin Field Study, Draft Tech. Memo. (CH2M HILL, 2009e)

TABLE B2-3
Summary of Previous Studies in Upper Basin, 2001 to 2008
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
OU 3	OU 3 Direct Push Field Investigation Summary	USEPA	2008	This study is a summary of field investigations, including the installation of piezometers and analysis of metals concentration data in soil.	The OU 3 Direct Push Investigation was implemented as planned and has provided needed data, which will be used to design follow-on studies and in the development of the groundwater conceptual model for the Osburn Flats area. The lithologic data collected will also be used in the development of the numerical groundwater flow model for the SFCDR watershed, which will be used to evaluate remedial options throughout the basin. Conclusions from this investigation are: • Cadmium concentrations in Osburn Flats area soils ranged from nondetect to 144 milligrams per kilogram (mg/kg). The highest cadmium concentrations were typically identified between 0 and 10 feet below ground surface (bgs). • Lead concentrations ranged from 8.9 mg/kg to 24,300 mg/kg, with the highest lead concentrations typically between ground surface and 10 feet bgs. • Zinc concentrations ranged from 27 mg/kg to 25,200 mg/kg; likewise, the highest concentrations were between ground surface and 10 feet bgs.	OU 3 Direct Push Field Investigation Summary, Draft Tech. Memo. (CH2M HILL, 2009i)
OU 2	OU 2 Direct Push Field Investigation Summary	USEPA	2008	This study is a summary of the installation of piezometers and metals concentration data in soil within OU 2.	During the OU 2 Direct Push Investigation, 315 soil samples were collected from 38 soil borings advanced into the upper alluvium of OU 2. These samples were submitted for laboratory analysis for Contract Laboratory Program (CLP) Target Analyte List (TAL) metals. Continuous composite samples for laboratory analysis were collected from each boring that was converted to a temporary piezometer. Conclusions from this sampling include: • The highest cadmium concentrations generally coincided with the tailings-affected soils in the areas from the Silver Mountain Resort parking lot west through the Bunker Creek corridor. The vertical extent of elevated cadmium concentrations was also consistent with lithologic observations of disturbed soils as described previously. Elevated cadmium concentrations were observed in all areas investigated in OU 2. • Lead concentrations exceeded the principal threat material threshold of 84,600 mg/kg in two soil borings located near the CTP and along the lower portion of Bunker Creek. The highest lead concentrations present in subsurface soils coincided with the observed tailings-impacted soils, which are primarily located between the Silver Mountain Resort parking lot west through the Bunker Creek corridor. Elevated lead concentrations were observed in most areas investigated in OU 2. • Elevated zinc concentrations were observed in soil from most soil borings advanced in OU 2. The highest zinc concentrations were observed in soil borings in the lower portion of Bunker Creek and in the Slag Pile area. These concentrations coincide with lithologic observations of tailings-affected soils in this area. Other significant zinc concentrations were measured in the eastern portion of the City of Kellogg, the West End Natural Infiltration (WENI) area, and near the Page wastewater treatment ponds.	OU 2 Direct Push Field Investigation Summary Tech. Memo. (CH2M HILL, 2009i)
Upper Basin, South Fork Coeur d'Alene River	Evaluation of Zinc Loading to the South Fork of the Coeur d'Alene River	USEPA	2007	This memorandum analyzes surface water, seep, adit, and groundwater data in the Upper Basin in order to identify where the primary zinc loading sources may originate.	The results of this analysis suggest that, within the Upper Basin area of the SFCDR, the largest source of dissolved metals loading to the river is the discharge from the Canyon Creek drainage. Numerous point sources such as adits and tailing piles, and distributed sources such as contaminated floodplain sediments, exist within the Canyon Creek watershed, and these sources collectively contribute to the overall metals load within Canyon Creek. Available data further suggest that the next largest contributors of dissolved metals to the SFCDR are: (1) the Ninemile Creek drainage; (2) the contaminated floodplain sediments in the vicinity of Osburn Flats (between Shields Gulch and Twomile Creek, Stations SF-241 to SF-249); (3) the contaminated floodplain sediments between Stations SF-249 and SF-254 (approximately 1 mile downstream from Osburn); and (4) the contaminated floodplain sediments between Stations SF-263 and SF-268 (near the confluence with Montgomery Creek).	Evaluation of Zinc Loading to the SFCDR, Upper Basin Analysis (CH2M HILL, 2007f)

TABLE B2-3
Summary of Previous Studies in Upper Basin, 2001 to 2008
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Study Location	Study Name	Responsible Party	Dates	Description	Key Conclusions	Reference
					Surface water sampling conducted on the SFCDR upstream and downstream from these reaches, and at the mouth of Ninemile Creek, suggest that each of these sources contribute a significant quantity of dissolved metals to the SFCDR. Available loading data suggest that the remainder of the potential source areas in the Upper Basin contribute fairly insignificant quantities of dissolved metals loading to the SFCDR.	

Table B6-1
RME Risk Characterization Summary - Carcinogens Residential Exposure Scenario - Child/Adult

Scenario Timeframe: Current/Future
Receptor Population: Residents
Receptor Age: Child/Adult

				Carcinogenic Risk			
				Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**
Lower Basin							
Soil	Surface Soil	Yard Soil	Arsenic	7E-05	N/A	8E-06	8E-05
Groundwater	Groundwater	Tap Water	Arsenic	2E-05	N/A	N/A	2E-05
						Total Risk:	1E-04
Upper Basin[a]							
Soil	Surface Soil	Yard Soil	Arsenic	7E-05	N/A	8E-06	8E-05
Groundwater	Groundwater	Tap Water	Arsenic	2E-04	N/A	N/A	2E-04
						Total Risk:	3E-04

[a]Only the Side Gulches area had cancer risks exceeding 10^{-4}.

Notes:
RME – reasonable maximum exposure
N/A – Route of exposure is not applicable to this medium

Table B6-2
RME Risk Characterization Summary - Non-Carcinogens
Residential Exposure Scenario - Child

Scenario Timeframe: Current/Future
Receptor Population: Residents
Receptor Age: Child (0 to 6 years)

					Non-Carcinogenic Hazard Quotients/Indices[a]			
					Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**
Lower Basin								
Soil	Surface Soil	Yard Soil	Arsenic	Skin	1	N/A	0.14	1
			Iron	Blood	2	N/A	N/A	2
Total Soil Hazard Index[b]								3
Upper Basin[c]								
Soil	Surface Soil	Yard Soil	Arsenic	Skin	0.6 – 1	N/A	0.06 - 0.1	0.6 - 1
			Iron	Blood	0.9 – 1	N/A	N/A	0.9 - 1
Total Soil Hazard Index								2 - 3
Groundwater	Groundwater	Tap Water	Arsenic	Skin	2	N/A	N/A	2
Total Tap Water Hazard Index								2
Groundwater	Groundwater	Future Drinking Water	Cadmium	Kidney	17	N/A	N/A	17
			Zinc	Blood	4	N/A	N/A	4
Total Future Groundwater Hazard Index								21
All Areas								
Soil	Plant Tissue	Homegrown Vegetables	Cadmium	Kidney	2	N/A	N/A	2
Total Soil Hazard Index								2

[a]None of the chemicals within one media/receptor group have similar target organ endpoints; therefore, separate total summaries by target organ are not provided.
[b]Note that all hazard quotients and indices are rounded to one significant figure per EPA guidance, and a hazard of 1, for example, could range between 0.95 and 1.4. Therefore, totals may not look as if they add up correctly.
[c]The Upper Basin was evaluated as seven separate sub-areas; consequently hazards for soil are provided as ranges based on the results from the seven areas. For groundwater, current tap water, only the Side Gulches area had concentrations exceeding target health goals. For groundwater, future drinking water, only the Burke/Ninemile area had shallow groundwater evaluated.

Notes:
RME - reasonable maximum exposure
N/A - Route of exposure is not applicable to this medium

Table B6-3
RME Risk Characterization Summary - Non-Carcinogens Residential Exposure Scenario - Child/Adult

Scenario Timeframe:	Current/Future
Receptor Population:	Residents
Receptor Age:	Child/Adult

					Non-Carcinogenic Hazard Quotients/Indices[a]			
					Ingestion	**Inhalation**		**Exposure Routes Total**
Upper Basin[c]								
Soil	Surface Soil	Yard Soil	Arsenic	Skin	0.4	N/A	0.04	0.4
			Iron	Blood	0.3	N/A	N/A	0.3
							Total Soil Hazard Index	0.7
Groundwater	Groundwater	Tap Water	Arsenic	Skin	1	N/A	N/A	1
							Total Tap Water Hazard Index	1
							Total Receptor Hazard Index	2
Groundwater	Groundwater	Future Drinking Water	Cadmium	Kidney	9	N/A	N/A	9
			Zinc	Blood	2	N/A	N/A	2
							Total Tap Water Hazard Index	11
All Areas								
Soil	Plant Tissue	Homegrown Vegetables	cadmium	Kidney	2	N/A	N/A	2
							Total Soil Hazard Index	2

[a]Note that all hazard quotients and indices are rounded to one significant figure per EPA guidance, and a hazard of 1, for example, could range between 0.95 and 1.4. Therefore, totals may not look as if they add up correctly.
[b]None of the chemicals within one media/receptor group have similar target organ endpoints; therefore, separate total summaries by target organ are not provided.
[c]The Upper Basin was evaluated as seven separate sub-areas; consequently hazards for soil are provided as ranges based on the results from the seven areas. For groundwater, current tap water, only the Side Gulches area had concentrations exceeding target health goals. For groundwater, future drinking water, only the Burke/Ninemile area had shallow groundwater evaluated.

RME – reasonable maximum exposure
N/A – Route of exposure is not applicable to this medium

Table B6-4
RME Risk Characterization Summary - Non-Carcinogens Public Recreational Exposure Scenario - Child

Scenario Timeframe: Current/Future
Receptor Population: Visitor
Receptor Age: Child (0 to 6 years)

					Non-Carcinogenic Hazard Quotients/Indices[a]			
					Ingestion	Inhalation		Exposure Routes Total
Lower Basin								
Soil/Sediment	Soil/Sediment	Floodplain Soil/Sediment in Lower CDAR	Arsenic	Skin	0.4	N/A	0.1	0.5
			Iron	Blood	0.6	N/A	N/A	0.6
			Manganese	Central Nervous System (CNS)	0.4	N/A	N/A	0.4
Total Soil Hazard Index								2
Upper Basin								
Soil/Sediment	Soil/Sediment	Surface Soil and Beach Sediments near confluence of North and South Forks CDAR was only location with exceedances	Arsenic	Skin	0.6	N/A	0.1	0.7
			Iron	Blood	0.6	N/A	N/A	0.6
			Manganese	Central Nervous System (CNS)	0.3	N/A	N/A	0.3
Total Soil Hazard Index								2

[a]Note that all hazard quotients and indices are rounded to one significant figure per EPA guidance, and a hazard of 1, for example, could range between 0.95 and 1.4. Therefore, totals may not look as if they add up correctly.
[b]None of the chemicals within one media/receptor group have similar target organ endpoints; therefore, separate total summaries by target organ are not provided.

Notes:
RME – reasonable maximum exposure
N/A – Route of exposure is not applicable to this medium
CDAR – Coeur d'Alene River

Table B6-5
RME Risk Characterization Summary - Carcinogens Subsistence Exposure Scenario - Child/Adult

Scenario Timeframe:	Future	
Receptor Population:	Subsistence Residents	
Receptor Age:	Child/Adult	

				Carcinogenic Risk			
				Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**
Traditional Subsistence							
Soil	Surface Soil	Floodplain Surface Soil	Arsenic	6E-04	N/A	2E-04	8E-04
Sediment	Sediment	Floodplain Sediment	Arsenic	4E-04	N/A	7E-04	1E-03
Undisturbed Surface Water	Undisturbed Surface Water	Lower CDAR	Arsenic	1E-03	N/A	N/A	1E-03
						Total Risk	3E-03
Modern Subsistence							
Soil	Surface Soil	Floodplain Surface Soil	Arsenic	1E-04	N/A	7E-05	2E-04
Sediment	Sediment	Floodplain Sediment	Arsenic	1E-04	N/A	2E-04	3E-04
Undisturbed Surface Water	Undisturbed Surface Water	Lower CDAR	Arsenic	2E-04	N/A	N/A	2E-04
						Total Risk	7E-04

Notes:
RME – reasonable maximum exposure
N/A – Route of exposure is not applicable to this medium
CDAR – Coeur d'Alene River

Table B6-6
RME Risk Characterization Summary - Non-Carcinogens
Subsistence Exposure Scenario - Child

Scenario Timeframe: Future
Receptor Population: Subsistence Residents
Receptor Age: Child (0 to 6 years)

					Carcinogenic Hazard Quotients/Indices[a]			
								Exposure Routes Total
Traditional Subsistence								
Soil	Surface Soil	Floodplain Surface Soil	Antimony	Blood	1	N/A	N/A	1
			Arsenic	Skin	5	N/A	2	7
			Cadmium	Kidney	0.6	N/A	0.14	0.8
			Iron	Blood	7	N/A	N/A	7
			Manganese	Central Nervous System (CNS)	4	N/A	N/A	4
							Total Soil Hazard Index	19
Sediment	Sediment	Floodplain Sediment	Antimony	Blood	0.7	N/A	N/A	0.7
			Arsenic	Skin	3	N/A	2	5
			Cadmium	Kidney	0.5	N/A	0.3	0.8
			Iron	Blood	4	N/A	N/A	4
			Manganese	CNS	3	N/A	N/A	3
							Total Sediment Hazard Index	14
Undisturbed Surface Water	Undisturbed Surface Water	Lower CDAR	Arsenic	Skin	7	N/A	N/A	7
							Total Undisturbed Surface Water Hazard Index	7
							Total Receptor Hazard Index	39
							Blood Hazard Index	13
							Skin Hazard Index	18
							Kidney Hazard Index	2
							CNS Hazard Index	6
Modern								
Soil	Surface Soil	Floodplain Surface Soil	Arsenic	Skin	0.8	N/A	0.3	1
			Iron	Blood	1	N/A	N/A	1
			Manganese	CNS	0.6	N/A	N/A	0.6
							Total Soil Hazard Index	3
Sediment	Sediment	Floodplain Sediment	Arsenic	Skin	1	N/A	0.7	2
			Iron	Blood	1	N/A	N/A	1
			Manganese	CNS	0.8	N/A	N/A	0.8
							Total Sediment Hazard Index	3
Undisturbed Surface Water	Undisturbed Surface Water	Lower CDAR	Arsenic	Skin	1	N/A	N/A	1
							Total Undisturbed Surface Water Hazard Index	1
							Total Receptor Hazard Index	7
							Blood Hazard Index	2
							Skin Hazard Index	4
							CNS Hazard Index	1

Table B6-6 (Continued)
RME Risk Characterization Summary - Non-Carcinogens
Subsistence Exposure Scenario – Child

[a]Note that all hazard quotients and indices are rounded to one significant figure per EPA guidance, and a hazard of 1, for example, could range between 0.95 and 1.4. Therefore, totals may not look as if they add up correctly.

Notes:
RME – reasonable maximum exposure
N/A – Route of exposure is not applicable to this medium
CDAR – Coeur d'Alene River

Table B6-7
RME Risk Characterization Summary - Non-Carcinogens
Subsistence Exposure Scenario - Child/Adult

Scenario Timeframe: Future
Receptor Population: Subsistence Residents
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotients/Indices[a]			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Traditional								
Soil	Surface Soil	Floodplain Surface Soil	Arsenic	Skin	1	N/A	0.5	2
			Iron	Blood	2	N/A	N/A	2
			Manganese	Central Nervous System (CNS)	1	N/A	N/A	1
Total Soil Hazard Index								5
Sediment	Sediment	Floodplain Sediment	Arsenic	Skin	0.8	N/A	2	2
			Iron	Blood	1	N/A	N/A	1
			Manganese	CNS	0.7	N/A	N/A	0.7
Total Sediment Hazard Index								4
Undisturbed Surface Water	Undisturbed Surface Water	Lower CDAR	Arsenic	Skin	3	N/A	N/A	3
Total Undisturbed Surface Water Hazard Index								3
Surface Water/Sediment	Plant Tissue	Water Potato (with skin)	Cadmium	Kidney	4	N/A	N/A	4
Total Water Potato (with skin) Hazard								4
Surface Water/Sediment	Animal Tissue	Northern Pike in Lower CDAR	Methylmercury	CNS	10	N/A	N/A	10
Total Northern Pike Hazard Index								10
Total Receptor Hazard Index								26
Blood Hazard Index								3
Skin Hazard Index								7
CNS Hazard Index								12
Kidney Hazard Index								4
Modern								
Soil	Surface Soil	Floodplain Surface Soil	Arsenic	Skin	0.2	N/A	0.2	0.4
			Iron	Blood	0.3	N/A	N/A	0.3
Total Soil Hazard Index								0.7
Sediment	Sediment	Floodplain Sediment	Arsenic	Skin	0.2	N/A	0.4	0.7
			Iron	Blood	0.4	N/A	N/A	0.4
Total Sediment Hazard Index								1
Undisturbed Surface Water	Undisturbed Surface Water	Lower CDAR	Arsenic	Skin	0.5	N/A	N/A	0.5
Total Undisturbed Surface Water Hazard Index								0.5
Surface Water/Sediment	Animal Tissue	Northern Pike in Lower CDAR	Methylmercury	CNS	3	N/A	N/A	3
Total Northern Pike Hazard Index								3
Total Receptor Hazard Index								5
Blood Hazard Index								0.7
Skin Hazard Index								2
CNS Hazard Index								3

Table B6-7 (Continued)
RME Risk Characterization Summary - Non-Carcinogens
Subsistence Exposure Scenario - Child/Adult

[a]Note that all hazard quotients and indices are rounded to one significant figure per EPA guidance, and a hazard of 1, for example, could range between 0.95 and 1.4. Therefore, totals may not look as if they add up correctly.

Notes:
RME – reasonable maximum exposure
N/A – Route of exposure is not applicable to this medium
CDAR – Coeur d'Alene River

Table B6-8
Summary of Results From the Coeur d'Alene Basin Ecological Risk Assessment

Receptor Type		Lines of Evidence	Risk to Receptors	COPEC Posing Risk (COPECs = As, Cd, Cu, Pb, Hg, Zn)	Receptors with No Identified Risk	Areas with No Identified Risk
Birds	24	Single-chemical external exposure, single-chemical internal exposure (blood), single-chemical internal exposure (liver or kidney), ambient toxicity tests, biological surveys	21 of 24 receptors showed risk from at least one metal, maximum LOAEL-based HQ for Pb=387 (spotted sandpiper), HQ for Zn=35 (song sparrow), HQ for Cd=6.12 (song sparrow)	Pb followed by Zn, then Cd and Cu pose greatest risks; risks from Hg are minimal; risks from As are absent; at least one COPEC in almost every CSM Unit or segment presented a risk for all but three avian species	Osprey, bald eagle, northern harrier	Beaver and Prichard Creeks in CSM Unit 1
Mammals	18	Single-chemical external exposure, single-chemical internal exposure (liver or kidney), ambient toxicity test	12 of 18 receptors showed risk from at least 1 metal; maximum ED_{20}-based HQ for Zn=25.5 (masked shrew), HQ for As=4.4 (muskrat), HQ for Cu=1.55 (masked shrew)	Although no one COPEC was the dominant risk driver, risks from Zn and Pb were most widely distrbuted, followed by Cd, As, Hg, and Cu	Fisher, wolverine, river otter, gray wolf, lynx, beaver	Beaver and Prichard Creeks in CSM Unit 1
Fish and Other Aquatic Organisms	13+	Single-chemical toxicity testing, site-specific toxicity testing, biological surveys	Risks to survival, growth, and reproduction of fish and benthic invertebrates because of concentrations of metals 10 times that of acute and chronic ambient water quality criteria in more than 25 and 50 percent of samples, respectively, from some areas	Cd, Cu, Pb, and Zn pose a risk in surface water to fish and other aquatic organisms; As, Cd, Cu, Pb, and Zn in sediment pose a potential risk to fish and other aquatic organisms	None identified	No areas identified

Table B6-8 (Continued)
Summary of Results from The Coeur d'Alene Basin Ecological Risk Assessment

Receptor Type		Lines of Evidence	Risk to Receptors	COPEC Posing Risk (COPECs = As, Cd, Cu, Pb, Hg, Zn)	Receptors with No Identified Risk	Areas with No Identified Risk
Amphibians	4	Single-chemical toxicity data, ambient media toxicity tests, biological surveys	Risk posed to three of four receptors	Cd, Cu, Pb, and Zn pose risks; Cd and Pb present individual risk to three receptors in four locations; Cu presents individual-level risks at six locations; Zn presents individual-level risk at seven locations; Pb presents greatest risk in upper basin, Cd presented greatest risk in lower basin, Zn presents risks throughout	Long-toed salamander	Big, Moon, and Prichard Creeks in CSM Unit 1
Terrestrial Plants	6	Single-chemical toxicity data, ambient media toxicity tests, biological surveys	All six plant receptors at risk	As, Cd, Pb, Zn, and Cu pose risk to plants at community or population level; As, Cd, Pb, and Zn pose risk to Ute ladies'-tresses in CSM Units 1,2, 3 and 5	None identified	Beaver and Prichard Creeks in CSM Unit 1
Soil Invertebrates	1	Single-chemical toxicity data	Receptors at risk	Pb and Zn pose risk in CSM Units 1, 2, 3, and 5; Cd poses risk in Canyon Creek and Upper South Fork in CSM 1 and all segments of 2, 3, and 5; Cu poses risk in Big, Canyon, and Ninemile Creeks and the Upper South Fork in CSM Unit 1, and in all segements of Units 2 and 3; As poses risk in Pine Creek and Upper South Fork in CSM Unit 1 and in all of CSM Units 2 and 3	None identified	Beaver and Prichard Creeks in CSM Unit 1

Table B6-8 (Continued)
Summary of Results from The Coeur d'Alene Basin Ecological Risk Assessment

Receptor Type		Lines of Evidence	Risk to Receptors	COPEC Posing Risk (COPECs = As, Cd, Cu, Pb, Hg, Zn)	Receptors with No Identified Risk	Areas with No Identified Risk
Soil processes	1	Single-chemical toxicity data	Receptors at risk	Pb and Zn pose risk in all segments of CSM Units 1, 2, and 3; Cd poses risk in five of six segments in CSM Unit 3; Cu poses risk in Canyon and Ninemile Creeks and the Upper South Fork in CSM Unit 1 and in 2 segments of CSM Unit 3; As poses risk in CSM Unit 3	None identified	Beaver and Prichard Creeks in CSM Unit 1

Notes:
NA - not applicable
No soil data were available from the Beaver or Prichard Creek watersheds.

Table B6-9
Summary of Results from the Measures of Ecosystem and Receptor Characteristics Analysis in the Coeur d'Alene Ecological Risk Assessment

				Extent of Adverse Effects - Narrative
Upper South Fork Coeur d'Alene River	Riparian HSI	Low	• Stream channel and riparian areas modified by tailings pond and mining facility development. • Recovery of riparian vegetation impaired by floodplain deposits and tailings ponds. • Historic inputs of contaminated bedload and mine tailings material to the stream channel. • Floodplain deposits of hazardous substances in downstream areas. • Ecological connectivity has been fragmented by degraded conditions in downstream segments.	Mining related activities and impacts increase on a downstream gradient. Conditions range from relatively intact riparian and riverine habitat conditions in the upper half of the drainage, to increasingly degraded conditions in downstream reaches. Ecological connectivity of intact habitats fragmented by degraded conditions in the Mid-Gradient SFCDR watershed.
	Bank Stability	None		
	Substrate Composition and Mobility	None		
	Temperature	None		
	Spatial Distribution and Connectivity	Moderate		
Canyon Creek	Riparian HSI	None to High	• Historic inputs of contaminated bedload and mine tailings material to the stream channel. • Floodplain deposits of hazardous substances in the downstream segments of the watershed. • Recovery of riparian vegetation limited in some areas by loss of topsoil (due to ore recovery activities), and phytotoxic levels of contaminants in soils. • Channel destabilization due to inputs of bedload material and loss of bank vegetation. • High stream temperatures due to lack of shading vegetation. • Disrupted surface water/groundwater relationships due to riparian zone impacts. • Ecological connectivity fragmented due to extensive degradation in downstream segments.	Relatively intact conditions in CCSeg01 and portions of CCSeg02. Loss of bank and stream channel structure in CCSeg03, CCSeg04, and CCSeg05. Bank and channel instability in these areas exacerbated by lack of riparian vegetation. Lack of shade and degraded channel structure contributes to high stream temperatuers in CCSeg05. Ecological connectivity of intact habitats fragmented by degraded conditions in downstream segments of the watershed, and in the Mid-Gradient SFCDR watershed.
	Bank Stability	None to Moderate		
	Substrate Composition and Mobility	None to Moderate		
	Temperature	High		
	Spatial Distribution and Connectivity	High		

Table B6-9 (Continued)
Summary of Results from the Measures of Ecosystem and Receptor Characteristics Analysis in the Coeur d'Alene Ecological Risk Assessment

				Extent of Adverse Effects - Narrative
Ninemile Creek	Riparian HSI	None to High	Similar conditions to the Canyon Creek watershed	Loss of channel structure in NMSeg01, NMSeg02, and NMSeg04 due to historic inputs of bedload and tailings material. Degraded riparian vegetation structure and high stream temperatures due to lack of shade in downstream areas of watershed. Ecological connectivity fragmented by degraded conditions within the watershed and downstream in Mid-Gradient SFCDR watershed.
	Bank Stability	None to Moderate		
	Substrate Composition and Mobility	Moderate		
	Temperature	High		
	Spatial Distribution and Connectivity	High		
Big Creek	Riparian HSI	None to Moderate	• Historic inputs of contaminated bedload and mine tailings material to the stream channel. • Channel destabilization due to inputs of bedload material and loss of bank vegetation. • Recovery of riparian vegetation limited in some areas by tailings pond development and potentially phytotoxic soils. • Ecological connectivity fragmented due to extensive degradation in downstream segments.	Limited mining related impacts in BigCrkSeg01, BigCrkSeg02, and BigCrkSeg03. More extensive mining related impacts in lower half of BigCrkSeg04, including milling facilities and wastepiles, tailings pond development, and floodplain deposits of contaminated material. Degraded riparian vegetation structure in tailings pond areas. Ecological connectivity of intact headwaters habitats fragmented by degraded conditions in BigCrkSeg04 and the Mid-Gradient SFCDR watershed.
	Bank Stability	Low		
	Substrate Composition and Mobility	Low		
	Temperature	Low		
	Spatial Distribution and Connectivity	High		
Moon Creek	Riparian HSI	None to Low	• Historic inputs of contaminated bedload and mine tailings material to the stream channel. • Floodplain deposits of hazardous substances in downstream areas.	Historic mining activities impacted the stream channel and riparian habitats of the mainstem of Moon Creek along most of its length. However, stream channel and riparian vegetation structure appears to have recovered in many areas. Ecological connectivity of intact habitats in MoonCrkSeg01 and MoonCrkSeg02
	Bank Stability	None to Low		
	Substrate Composition and Mobility	None	• Bank instability and deposition of fine grained material in the stream channel.	

Table B6-9 (Continued)
Summary of Results from the Measures of Ecosystem and Receptor Characteristics Analysis in the Coeur d'Alene Ecological Risk Assessment

				Extent of Adverse Effects - Narrative
Moon Creek (continued)	Temperature	None	• Ecological connectivity fragmented due to extensive degradation in downstream segments.	fragmented by degraded conditions in the Mid-Gradient SFCDR watershed.
	Spatial Distribution and Connectivity	High		
Pine Creek	Riparian HSI	High	• Historic inputs of contaminated bedload and mine tailings material to the stream channel. • Floodplain deposits of hazardous substances in downstream areas. • Channel destabilization due to inputs of bedload material and loss of bank vegetation. • Impaired recovery of riparian vegetation. • Ecological connectivity fragmented due to extensive degradation in downstream segments.	Historic mining activities impacted the stream channel and riparian habitats of PineCrkSeg01 (East Fork Pine Creek) along much of its length, and PineCrkSeg03 below the East Fork. Extensive floodplain and riparian zone impacts present in these segments. Remedial actions to reduce contamination and rehabilitate riparian and channel structure have been conducted by BLM. Ecological connectivity of intact habitats fragmented by degraded conditions in the Mid-Gradient SFCDR watershed.
	Bank Stability	None to High		
	Substrate Composition and Mobility	Low to Moderate		
	Temperature	None		
	Spatial Distribution and Connectivity	High		
Beaver Creek	No Measures Evaluated	-	Insufficient Information available to evaluate risks for all receptors.	
Prichard Creek	Riparian HSI	Moderate		
	Bank Stability	Low		
	Substrate Composition and Mobility	Low		
	Temperature	Low		
	Spatial Distribution and Connectivity	Moderate		

Table B6-9 (Continued)
Summary of Results from the Measures of Ecosystem and Receptor Characteristics Analysis in the Coeur d'Alene Ecological Risk Assessment

				Extent of Adverse Effects - Narrative
MidGradient SFCDR	Riparian HSI	High	• Extensive deposits of contaminated jig and floatation mining tailings material present in floodplains and riparian areas. • Channel destabilization due to inputs of bedload material and loss of bank vegetation. • Recovery of riparian vegetation limited in some areas by phytotoxic levels of hazardous substances in mining related floodplain deposits. • Degraded riparian and riverine habitat conditions throughout MidGradSeg01 and MidGradSeg02 contribute to fragmented ecological connectivity.	Floodplain deposits of jig and floatation era mine tailings present in depositional areas throughout the mid-gradient SFCDR. Loss of stabilizing riparian vegetation from phytotoxic effects, and large historic inputs of bedload material contribute to channel and substrate instabililty in the stream system. Degraded riparian and riverine structure and physical function throughout MidGradSeg01 and MidGradSeg02 contribute to fragmented ecological connectivity throughout the watershed.
	Bank Stability	Moderate to High		
	Substrate Composition and Mobility	Moderate		
	Temperature	High		
	Spatial Distribution and Connectivity	High		
North Fork Coeur d'Alene River	Riparian HSI	None		
	Bank Stability	Not Rated		
	Substrate Composition and Mobility	Not Rated		
	Temperature	Moderate		
	Spatial Distribution and Connectivity	None		
Mainstem Coeur d'Alene River	Riparian HSI	None		
	Bank Stability	None		
	Substrate Composition and Mobility	Not Rated		
	Temperature	None		
	Spatial Distribution and Connectivity	Not Rated		

Table B6-9 (Continued)
Summary of Results from the Measures of Ecosystem and Receptor Characteristics Analysis in the Coeur d'Alene Ecological Risk Assessment

				Extent of Adverse Effects - Narrative
Lower Coeur d'Alene River	Riparian HSI	Not Rated	• Extensive deposits of contaminated jig and floatation mining tailings material present in sediments on the river bottom and in lateral lakes and wetlands, and on the river bank and floodplain. • Degraded channel stability due to extensive bedload inputs. • Recovery of bank and riparian vegetation possibly limited by phytotoxic effects. • Recovery of bank and riparian vegetation possibly limited by phytotoxic effects. • Extensive bank erosion contributes to high levels of suspended solids and elevated sediment deposition rates.	Deposits of contaminated material along 260,000 feet (49 miles) of shoreline, averaging approximately 90 feet in width (CSM segments LCDRSeg02-LCDRSeg06). Actively eroding streambank identified along 57,900 feet (11 miles) of shoreline in all CSM segments, the majority associated with contaminated deposits.
	Bank Stability	Not Rated		
	Suspended Solids	Moderate		
	Sediment Deposition Rate	Low to High		
Coeur d'Alene Lake	Sediment Deposition Rate	None to High		Core sampling locations at the mouth of the Coeur d'Alene River and approximately 2.25 miles to the NW (CDALakeSeg02) indicate deposition rates corresponding to moderate to high adverse effects. All other locations throughout CDALakeSeg02 indicate no adverse effects. One location at the northern end of CDALakeSeg01 indicated deposition rates having a low level of adverse effects. The southern end of CDALakeSeg01 and CDALakeSeg03 were used as reference areas.

Table B6-9 (Continued)
Summary of Results from the Measures of Ecosystem and Receptor Characteristics Analysis in the Coeur d'Alene Ecological Risk Assessment

				Extent of Adverse Effects - Narrative
Upper Spokane River	Sediment Deposition Rate	None		Due to lack of adverse effects in areas of Coeur d'Alene Lake away from the mouth of the Coeur d'Alene River, no adverse effects are expected in the Spokane River

Notes:
HSI - Habitat Suitability Index

TABLE B7-1
Preliminary Remediation Goals for Soil (mg/kg) for Protection of Terrestrial Biota in the Upper Coeur d'Alene Basin[a]
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Soil Biota[b]	Wildlife[b]				90th Percentile of Soil-Sediment Background	
Analyte	**Population/ Community**	**Individual/ NOAEL-based**	**Population/ LOAEL-based**	**Population/ ED_{20}-based**	**Site-specific Individual-level PRG for Riparian Songbirds[b]**	**Upper Basin[c]**	**Idaho REM IDTLs[d]**
Arsenic	16.8	14	67	40	NA	22	0.391
Cadmium	10	9.8	105	386	NA	2.7	1.35
Copper	100	496	751	1021	NA	53	921
Lead	450	2.5	159	522	NA	171	49.6
Mercury	None provided	None provided	None provided	None provided	530[f]	0.3e	.005
Zinc	106	27	434	261	NA	280	886

Notes:
[a] Birds and mammals occurring in upland, agricultural, and riparian habitats; terrestrial plants and invertebrates; and soil processes.
[b] Based on various lines of evidence available for evaluation (such as comparisons to single-chemical laboratory toxicity studies; toxicity testing using soil, sediment, or water from the Coeur d'Alene Basin; and field studies in the basin) (Source: Remedial Investigation/Feasibility Study Risk Assessment in U.S. Environmental Protection Agency [USEPA], 2001).
[c] Gott and Cathrall (1980), and selected by USEPA as background values in the Remedial Investigation for the Coeur d'Alene Basin (USEPA, 2001a).
[d] State of Idaho Risk Evaluation Manual (REM), 2004. IDTLs = Initial Default Target Levels. Arsenic based on surficial soil exposure pathway; all other metals based on groundwater protection pathway.
[e] USEPA, 2001, *Final (Revision 2) Remedial Investigation Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study*, Volume 1, Part 7 (Summary), Table 3.2-1, "Selected Background Concentrations for Metals in the Basin".
[f] See Attachment 4-1.

ED_{20} = effective dose – 20 percent response
LOAEL = lowest observed adverse effects level
NOAEL = no observed adverse effects level
mg/kg = milligram(s) per kilogram
NA = not available

TABLE B7-2
Preliminary Remediation Goals for Soil (mg/kg) for Protection of Aquatic Birds and Mammals in the Upper Coeur d'Alene Basin[a]
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Wildlife[b]				
Analyte	**Individual/ NOAEL-based**	**Population/ LOAEL-based**	**Population/ ED_{20}-based**	**Site-specific Individual-level PRG for Waterfowl[b]**	**90th Percentile of Soil-Sediment Background, Upper Basin[c]**
Arsenic	54	222	138	NA	22
Cadmium	11.7	173	664	NA	2.7
Copper	1,606	2,157	2,209	NA	53
Mercury[d]		2.5	7	NA	0.3
Lead	3.65[e]	249[e]	718[e]	530[f]	171
Zinc	5.3	519	390	NA	280

Notes:
[a] Birds and mammals occurring in palustrine, lacustrine, and riverine habitats.
[b] 10th percentile of individual-level sediment PRGs calculated for tundra swans, Canada geese, mallards, and wood ducks.
[c] Gott and Cathrall (1980).
[d] Mercury was not measured in Lower Basin sediment samples. Therefore, a background concentration could not be calculated.
[e] For comparison, Beyer et al. (2000) derived a waterfowl no-effect concentration of 24 mg/kg and a lowest-effect concentration of 530 mg/kg, and concluded that waterfowl mortality would occur if concentrations exceed 1,800 mg/kg.
[f] See Attachment 4-1.
ED_{20} = effective dose – 20 percent response
LOAEL = lowest observed adverse effects level
NOAEL = no observed adverse effects level
mg/kg = milligram(s) per kilogram
NA = not available

TABLE B7-3
Preliminary Remediation Goals for Sediment for Protection of Human Health and Aquatic Organisms in the Upper Coeur d'Alene Basin[a]
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Analyte	Preliminary Remedial Goals (PRGs) (mg/kg dry weight)	
	Upper Basin [c]	**NOAA SQuiRT**[b]
Arsenic	22	5.9 – 33
Cadmium	2.7	0.583 – 10
Copper	53	16 – 197
Lead	530[d]	31 – 250
Mercury	0.3	0.174 – 2
Silver	1.1	0.5 – 4.5
Zinc	280	98 – 820

Notes:
[a] PRGs based on toxicity reference values; other PRGs default to background concentrations for those portions of the Basin.
[b] National Oceanic and Atmospheric Administration, 2008 Screening Quick Reference Tables (SQuiRT) -- Ranges for Freshwater Sediments.
[c] U.S. Environmental Protection Agency 2008 Ecological Soil Screening Levels (Eco-SSLs): freshwater sediment range for plants, soil biota, and avian and aquatic mammals.
[d] See Attachment 4-1.

mg/kg = milligram(s) per kilogram

TABLE B12-1
Potential Chemical-Specific ARARs and TBCs for Human Health and Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Groundwater		
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Designates uses for waters of the state and water quality standards protective of those uses. This regulation adopts water quality criteria for individual chemicals based on protection of beneficial uses.	Potentially applicable
Safe Drinking Water Act of 1974 (42 U.S.C. 300(f) et seq.), National Primary Drinking Water Standards, 40 CFR 141.61, and Maximum Contaminant Levels for Inorganic Contaminants, 40 CFR 141.62	Establishes maximum contaminant levels (MCLs) as criteria for groundwater and surface water that are or may be used for drinking water. The standards are designed to protect human health from the adverse effects of organic contaminants in the drinking water.	Potentially relevant and appropriate
Surface Water		
Idaho Water Quality Standards and Wastewater Treatment Requirements—Salmonid Sight Feeding Standard (IDAPA 58.01.02.250 and 284)	This standard (50 NT acute and 25 NT chronic above background) is often used to assess the effectiveness of erosion abatement efforts. South Fork Coeur d'Alene River subbasin aquatic life criteria for cadmium, lead, and zinc.	Potentially applicable
Clean Water Act (33 U.S.C. 1251 et seq.), "Water Quality Standards," 40 CFR 131, National Recommended Water Quality Criteria—2006	Establishes numeric water quality criteria for the protection of human health and aquatic organisms. Toxic criteria for the protection of aquatic life are provided in the water quality criteria regulations [40 CFR 131.36(b) (1)], which supersede criteria adopted by the state except where the state criteria are more stringent than the federal criteria.	Potentially relevant and appropriate
Soil		
Ecological Soil Screening Level (Eco-SSL) Guidance, OSWER Directive 9285.7-55	Provides a set of risk-based soil screening levels (Eco-SSLs) for several soil contaminants that are of ecological concern for terrestrial plants and animals at hazardous waste sites. Also describes the process used to derive these levels and provides guidance for their use.	Potentially TBC
Sediments		
NOAA Screening Quick Reference Tables (SQuiRT), NOAA Office of Response and Restoration Division (OR-R Report 08-1) (M.F. Buchman, 2008)	NOAA's SquiRT include screening concentrations for organics and inorganics in sediment, soil, and water.	Potentially TBC
Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME, 1999, updated 2002)	Summary Table 1, Interim Freshwater Sediment Quality Guidelines.	Potentially TBC

Notes:CCME = Canadian Council of Ministers of the Environment
CFR = *Code of Federal Regulations*
IDAPA = Idaho Administrative Procedures Act
NOAA = National Oceanic and Atmospheric Administration
OSWER = Office of Solid Waste and Emergency Response
TBC = to be considered
U.S.C. = United States Code

TABLE B12-2
Potential Chemical-Specific ARARs for Groundwater and Surface Water as Drinking Water in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Metal	MCL[a] (μg/L)	MCLG (μg/L)	Idaho Ground Water Quality Rule[d] (μg/L)
Arsenic	10	None	50
Cadmium	5	5	5
Copper	1,300[b]	1,300	1,300
Lead	15 [b]	Zero	15
Mercury	2	2	2
Zinc[c]	5,000	5,000	5,000

Notes:
[a] Primary drinking water standards only (secondary standards are for protection of aesthetic qualities of water). U.S. Environmental Protection Agency, June 2003. MCL = maximum contaminant level.
[b] Action level at the tap.
[c] Secondary drinking water standard.
[d] Idaho Administrative Procedures Act (IDAPA) 58.01.11, March 1997-- primary constituent standards except for zinc (secondary constituent standard). MCLG = maximum contaminant level goal.

μg/L = microgram(s) per liter

TABLE B12-3
Potential Location-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Federal		
American Indian Religious Freedom Act (42 U.S.C. 1996 et seq.)	Protects religious, ceremonial, and burial sites and the free practice of religions by Native American groups.	Potentially applicable
Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq., 43 CFR 10)	Protects Native American burial sites and funerary objects. If Native American graves are discovered within remediation areas, project activities must cease and consultation must take place between the Department of the Interior and the affected tribe.	Potentially applicable
National Historic Preservation Act [16 U.S.C. 470 et seq.; 36 CFR Parts 60, 63, 800; 40 CFR 6.301(b)]	Federal agencies must identify possible effects of proposed remedial activities on historic properties (cultural resources). If historic properties or landmarks eligible for, or included in, the National Register of Historic Places exist within remediation areas, remediation activities must be designed to minimize the effect on such properties or landmarks.	Potentially applicable
Archeological and Historic Preservation Act of 1979 [16 U.S.C. 469 et seq., 40 CFR 6.301(c); 470 aa-ii]	Establishes procedures to provide for preservation of historical and archaeological data that might be destroyed through the alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	Potentially applicable if the site contains historical or archaeological data. The presence or absence of such data on the site must be verified. If historical or archaeological artifacts are present in remediation areas, the remedial actions must be designed to minimize adverse effects on the artifacts.
Endangered Species Act (16 U.S.C. 1531 et seq.)	Requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of species designated as threatened or endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service.	Potentially applicable
Migratory Bird Treaty Act (16 U.S.C. 703 et seq.)	Protects all migratory bird species and prevents "take" without a permit (e.g., lead poisoning of waterfowl due to sediment ingestion) or by unauthorized methods. Hunting of migratory birds under a license is a regulated "taking".	Potentially relevant and appropriate
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (66 FR 3853)	Encourages federal agencies to integrate migratory bird conservation principles into plans and actions.	Potentially TBC
Bald and Golden Eagle Protection Act (16 U.S.C. 668; 50 CFR 22)	Provides for the protection of the bald eagle and the golden eagle by prohibiting the unpermitted taking, possession, sale, purchase, barter, offer to sell,	Potentially relevant and appropriate

TABLE B12-3
Potential Location-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
	purchase, or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg [16 U.S.C. 668(a); 50 CFR 22]. "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb [16 U.S.C. 688(c); 50 CFR 22.3].	
Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901et seq.; 50 CFR 83)	Preserve and promote conservation of non-game fish and wildlife and their habitats.	Potentially applicable
Fish and Wildlife Coordination Act of 1980 [16 U.S.C. 661 et seq.; 40CFR 6.302(g)]	Requires consultation with the U.S. Fish and Wildlife Service (and the Idaho Department of Fish and Game) when any modification of a stream or other waterbody greater than 10 hectares is proposed; requires adequate provisions for protection of fish and wildlife, including permanent or temporary mitigation.	Potentially applicable
Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.; 33 CFR 320-330)	Prohibits unauthorized obstruction or alteration of navigable waters.	Potentially applicable
Clean Water Act of 1977 (Sections 404 and 401) - Dredge or Fill Requirements (33 U.S.C. 1251-1376; 33 CFR Parts 320-330; 40 CFR Part 230)	Establishes requirements that limit the discharge of dredged or fill material into navigable waters and associated wetlands. USEPA guidelines for discharge of dredged or fill materials in 40 CFR Part 230 specify consideration of alternatives that have less adverse impacts and prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardy of threatened or endangered species. Special consideration required for "special aquatic sites" defined to include wetlands.	Potentially applicable. Certain proposed alternatives may result in the temporary or permanent loss of or damage to surface water and wetlands through dredging and filling activities.
Protection of Wetlands [Executive Order 11990; 40 CFR 6.302(a); 40 CFR Part 6, Appendix A]	Requires federal agencies to take action to avoid adversely impacting wetlands, minimize wetland destruction, and preserve the value of wetlands. Also provides for wetlands enhancement and restoration.	Potentially applicable
Considering Wetlands at CERCLA Site Guidance (OSWER 9280.03, May 1994)	Provides guidance for considering potential impacts of response actions on wetlands at CERCLA sites.	Potentially TBC
Protection of Floodplains [Executive Order 11988; 40 CFR 6.302(b); 40 CFR Part 6, Appendix A]	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain.	Potentially applicable where tailings and other wastes are located within the 100-year floodplain.
RCRA: Location Standards for Hazardous Waste Facilities-100 Year Floodplains [42 U.S.C. 6901; 40 CFR 264.18(b)]	Hazardous waste treatment, storage, and disposal facilities (TSDFs) located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any 100-year floodplain.	Potentially relevant and appropriate

TABLE B12-3
Potential Location-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
State		
Idaho Water Quality and Wastewater Treatment—Hazardous and Deleterious Material Storage [Idaho Statute 39-105 and 39-3601 et seq.; IDAPA 58.01.02.800]	Hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters, unless adequate measures and controls are provided to ensure that those materials will not enter state waters as a result of high water, precipitation runoff, wind, storage facility failure, accidents in operation, or unauthorized third-party activities.	Potentially applicable
Idaho Siting of Hazardous Waste Disposal Facility (Idaho Code 39-5801 et seq.) and Idaho Rules and Standards for Hazardous Waste (IDAPA 58.01.05)	The remedial action will be designed to satisfy some of the technical criteria in the Idaho Hazardous Waste Siting Management Plan as adopted by the Idaho State Legislature. Consideration will be given in remedy design to general considerations referenced by the Hazardous Waste Facility Siting Act. However, a siting license for an onsite hazardous waste disposal facility is not required.	Potentially relevant and appropriate
Idaho Lakes Protection Act [Idaho Code 58-104(9) and 58-1301 et seq.; IDAPA 20.03.04]	Requires that the protection of property, navigation, fish and wildlife habitat, aquatic life, recreation, aesthetic beauty, and water quality be given due consideration and weighed against the navigational or economic justification for encroachments of beds or waters of navigable lakes of the state.	Potentially applicable
Idaho Classification and Protection of Wildlife (Idaho Statute 36-201 and IDAPA 13.01.06)	The Idaho Department of Fish and Game classifies wildlife as game, protected non-game, endangered, threatened, and species of special concern. None of the protected non-game species of special concern, threatened, or endangered species may be taken or possessed.	Potentially relevant and appropriate
Idaho Preservation of Historical Sites (Idaho Statute 67-4601 et seq.) and Idaho State Historical Society (Idaho Statute 67-4101 et seq.)	Covers historical sites and districts within the State of Idaho and the excavation of archaeological resources. The Idaho State Historical Society is a state agency. It publishes the National Register of Historic Places for Idaho.	Potentially applicable

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = *Code of Federal Regulations;* USEPA = U.S. Environmental Protection Agency; FR = Federal Register
IDAPA = Idaho Administrative Procedures Act; OSWER = Office of Sold Waste and Emergency Response
RCRA = Resource Conservation and Recovery Act; TBC = to be considered; U.S.C. = United States Code

TABLE B12-4
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Federal		
RCRA: Subtitle C—Exemption for Extraction, Beneficiation and Processing Mining Waste [40 CFR 261.4(b)(7)]	USEPA exempts mining wastes from the extraction, beneficiation, and some processing of ores and minerals, in accordance with the Bevill amendment to RCRA.	Potentially applicable
RCRA: Subtitle C—Hazardous Waste Characteristics (40 CFR 261.20)	Generators of solid waste must determine whether the waste is hazardous. A solid waste is hazardous if it exhibits the toxicity characteristic (based on extraction procedure Method 1311).	Potentially applicable to solid waste generated during remediation
RCRA: Subtitle C—Hazardous Remediation Waste Management Requirements (HWIR-Media) (40 CFR 264.554)	The use of staging piles can facilitate short-term storage of remediation wastes so that sufficient volumes can be accumulated for shipment to an offsite treatment facility or for efficient onsite treatment. The regulations contain performance standards for these piles.	If contaminated media hazardous waste, potentially applicable; if not, potentially relevant and appropriate
RCRA Subtitle C—Hazardous Waste Treatment and Storage (40 CFR 264)	Requirements for storing or treating hazardous wastes in tanks, containers, or surface impoundments. Subpart F addresses groundwater monitoring at hazardous waste treatment, storage, and disposal facilities (TSDFs). Closure requirements for hazardous waste repositories are covered under Subpart G. Hazardous waste landfills must meet minimum design standards under Subpart N.	Potentially relevant and appropriate
RCRA Subtitle C—Treatment Standards for Hazardous Waste Debris (40 CFR 268.45)	Hazardous debris must be treated through identified technologies or standards, unless USEPA determines that debris is no longer contaminated, pursuant to 40 CFR 261.3(e)(2).	Potentially applicable
RCRA: Subtitle D—RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices (42 U.S.C. 6901 et seq.; 40 CFR 257)	Certain criteria are required to be met by solid waste disposal facilities and practices, such as not restricting the base flow of the floodplain, not taking threatened or endangered species, and not causing a discharge to navigable waters.	Potentially relevant and appropriate
RCRA Subtitle D—Disposal of Nonhazardous Solid Waste (42 U.S.C. 6901 et seq.; 40 CFR Part 258)	Provides criteria for cover material, run-on/runoff control systems, access control, liquid restrictions.	Potentially relevant and appropriate requirement
Best Management Practices for Soil Treatment Technologies (OSWER, 1997)	Provides technologies for controlling cross-media transfer of contaminants during materials handling activities.	Potentially TBC during excavation of contaminated soil

TABLE B12-4
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Clean Water Act/Water Pollution Control Act (33 U.S.C. 1251) Effluent Limitations (Sections 301-302) Water Quality Standards (Section 303) Federal Water Quality Criteria (Section 304) National Performance Standards (Section 306) Toxic and Pre-Treatment Standards (Section 307) National Pollutant Discharge Elimination System (Section 402)	These regulations govern water quality, including water discharged as part of a remedial process. Section 307—Pretreatment regulations under 40 CFR Part 403 provide for limits on discharge to a sanitary sewer system, protecting the municipal system from accepting wastewater that would cause it to exceed its NPDES permit discharge limits. Section 401—Water Quality Certification requires that USEPA receive a water quality certification from a state that a given project requiring a federal permit that may result in a discharge to navigable water will comply with the state's water quality standards. Section 402—The NPDES program establishes a comprehensive framework for addressing processing water and stormwater discharges under the program. Requires that point-source discharges not cause the exceedance of surface water quality standards outside the mixing zone. Specifies requirements under 40 CFR 122.26 for point-source discharge of stormwater from construction sites to surface water and provides for Best Management Practices such as erosion control for removal and management of sediment to prevent run-on and runoff.	Potentially applicable or relevant and appropriate
Clean Air Act (42 U.S.C. 7401 et seq.)	Requires minimization of the harmful effects to air quality from excavation, construction, and other removal activities.	Potentially applicable or relevant and appropriate
Surface Mining Control and Reclamation Act of 1977 (SMCRA) (30 U.S.C. 1201 et seq., 30 CFR 816)	Requires the protection of human health and the environment from the adverse effects of current and past surface coal mining operations. Some of the potentially relevant and appropriate requirements for the removal of contaminated surface soil include: --Stabilization of all exposed surface areas to effectively control erosion and air pollution attendant to erosion (30 CFR 816.95). --Use of best technology currently available to (1) minimize disturbances to and adverse impacts on fish, wildlife, and related environmental values and to achieve enhancement of such if possible; (2) conduct no activity that may jeopardize the continued existence of endangered species or that is likely to destroy or adversely modify their critical habitat; and (3) avoid disturbances to, enhance where practicable, or restore or replace wetlands, riparian vegetation, and habitats for fish and wildlife (30 CFR 816.97).	Potentially relevant and appropriate. Although coal mining did not occur in the Coeur d'Alene Basin, SMCRA requirements may be relevant and appropriate for cleanup of other types of mining sites.

TABLE B12-4
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
State		
Idaho Rules and Standards for Hazardous Waste-Management of Hazardous Waste (IDAPA 58.01.05 et. seq.) and Land Disposal Restrictions (IDAPA 58.01.05.011)	Hazardous wastes that are generated must be managed in accordance with the generation and transportation, storage, and disposal requirements. LDRs place specific requirements (concentration or treatment) on RCRA hazardous wastes prior to their placement in a land disposal unit.	Potentially relevant and appropriate if any material accumulations are treated *ex situ*
Idaho Solid Waste Management Rules and Standards (IDAPA 58.01.06)	Requires all solid waste be managed to prevent human health hazards, public nuisances, or pollution of the environment. Elements relating to landfill cover, surface water management, and erosion control may be ARARs.	Potentially applicable or relevant and appropriate
Mine and Mill Waste Remedial Guidelines and Best Management Practices (Coeur d'Alene Basin Restoration Project)	Design and implementation of selected response actions should consider a number of factors and techniques for protecting water quality, fish and wildlife habitat, while minimizing the potential for human exposure.	Potentially TBC
Best Management Practices and Guidelines for Mine Tailings Repositories	Provides guidelines for location, design, construction, and management of mine waste repositories.	Potentially TBC
Idaho Rules Governing Exploration and Surface Mining—Best Management Practices, Reclamation (IDAPA 20.03.02.060, .140, .160)	Reclamation requirements include best management practices for the protection of water quality, non-point sediment control, clearing and grubbing operations, overburden and topsoil requirements to enhance revegetation of disturbed areas, and road construction requirements to minimize erosion. Additional best management practices are specified for backfilling and grading and revegetation activities.	Potentially relevant and appropriate
Idaho Mine Tailings Impoundment Structure Rules (IDAPA 37.03.05)	Design elements of the regulation may be relevant and appropriate to construction of regional repositories. Construction, enlargement, and alteration of mine tailings impoundments must conform to specific design specifications, spillways or diversion structures, cutoff walls, filters, and embankment slopes.	Potentially relevant and appropriate
Idaho Stream Channel Alteration Rules (IDAPA 37.03.07)	Governs the alteration of stream channels in Idaho.	Potentially applicable

TABLE B12-4
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation
Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02)	Restrictions are placed on the discharge of wastewaters and on human activities that may adversely affect water quality in state waters. Under IDAPA 58.01.02.800, hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters unless adequate measures and controls are provided to ensure that those materials will not enter state waters. Deleterious materials are defined as any non-toxic substances that may cause the tainting of edible species of fish, taste and odors in drinking water supplies, or the reduction of the usability of water without causing physical injury to water users or aquatic and terrestrial organisms. Non-point source activities conducted in a manner that demonstrates a knowledgeable and reasonable effort to minimize resulting adverse water quality impacts are not subject to conditions or legal actions (IDAPA 58.01.02.350.02.a).	Potentially applicable
Idaho Non-Point Source Management Plan, Final (December 1999)	Remedial activities should be consistent with the state's goal of restoration, maintenance, and protection of the beneficial uses of both surface water and groundwater. Long-term goals include design and implementation of Best Management Practices for surface water and groundwater.	Potential TBC
Idaho Air Pollution Control Rules (IDAPA 58.01.01)	Requires that remedial activities be designed to take all reasonable precautions to prevent particulate matter from becoming airborne, including the use of water or chemicals as dust suppressants, the covering of trucks, and the prompt removal and handling of excavated materials.	Potentially applicable
Idaho Asbestos Statute	Any asbestos-containing materials encountered in mill demolition must be removed and disposed of in accordance with these regulations.	Potentially applicable
Idaho Land Remediation Rules (IDAPA 58.01.18.027)	Institutional controls may be used in instances where residual concentrations of chemicals exceed risk-based health standards, or when they are required to ensure the continued protection of human health and the environment or the integrity of the cleanup action.	Potentially applicable

TABLE B12-4
Potential Action-Specific ARARs and TBCs for Ecological Receptors in the Upper Coeur d'Alene Basin
Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Citation	Summary of Requirement	Evaluation

Notes:
ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
FR = Federal Register
HWIR = Hazardous Waste Identification Rule
IDAPA = Idaho Administrative Procedures Act
LDR = Land Disposal Restriction
NPDES = National Pollutant Discharge Elimination System
OSWER = Office of Sold Waste and Emergency Response
RCRA = Resource Conservation and Recovery Act
TBC = to be considered
USEPA = U.S. Environmental Protection Agency

APPENDIX D

Cost Analysis Documentation

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D-1 Technical Memorandum: CTP Expansion for Treatment of Other OU 2 and OU 3 Waters

Acronyms and Abbreviations

bgs	below ground surface
BLM	Bureau of Land Management
CPES	CH2M HILL Parametric Cost Estimating System
CTP	Central Treatment Plant
CY	cubic yards
FML	flexible membrane liner
FS	Feasibility Study
FFS	Focused Feasibility Study
gpm	gallons per minute
NPV	net present value
O&M	operation and maintenance
TCD	typical conceptual design
USEPA	U.S. Environmental Protection Agency Region 10

APPENDIX D

Cost Analysis Documentation

This appendix provides a detailed description of the processes used to develop cost estimates for the Focused Feasibility Study (FFS) for the Coeur d'Alene Basin. The appendix is organized by typical conceptual design (TCD) costs (Section D.1), remedy protection costs (Section D.2), and site-by-site costs for Alternatives 3+ and 4+ (Section D.3).

D.1 TCD Cost Estimation and Application

This section presents the methodology and assumptions used to develop the cost estimates for the TCDs included in Alternatives 3+ and 4+. The development of these TCDs is described in Section 5.0 of the FFS Report. Costs were developed based upon principles outlined in U.S. Environmental Protection Agency's (USEPA's) *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (2000).

Detailed unit cost estimates are summarized by TCD in Tables D-1 through D-5. Direct capital costs were calculated for each individual action, characterized by a TCD, on a source material. The direct capital cost was calculated using the TCD unit cost and the appropriate measurement, which is specific to the site and source material. The indirect capital costs were assumed to be 70 percent of the direct capital costs for all TCDs except for WT01, active treatment at the Central Treatment Plant (CTP) discussed in Attachment D-1 (which follows the tables in this appendix). This assumption was based on information provided in USEPA (2000). Operation and maintenance (O&M) costs were assumed to be a percentage of the direct capital costs and varied for each TCD.

The O&M costs were calculated as the net present value (NPV) of 30 years of O&M at a discount rate of 7 percent (USEPA, 2000). The total cost is the sum of direct capital, indirect capital, and O&M costs. The nominal accuracy of these estimates is –30 percent to +50 percent. Assumptions and limitations used in the development of the unit costs are summarized in Tables D-6 through D-10.

For TCDs retained from the *Final (Revision 2) Feasibility Study Report, Coeur d'Alene Basin Remedial Investigation/Feasibility Study* (2001 FS Report; USEPA, 2001), costs were escalated to 2009 values assuming an escalation factor of 1.358. This value was developed from the Engineering News Record *Construction and Building Cost Index* (2008). For new TCDs, costs were developed by calculating unit costs for materials, labor, and equipment. These values were then summed to determine the direct capital unit cost for each TCD.

D.1.1 Source Control TCDs

All of the source control TCDs were retained from the 2001 FS Report, and the costs were escalated as described above with the exception of C02c. TCD C02c was developed in 2007, and no detailed cost breakdown is available (URS, 2007).

A number of assumptions were used when applying these TCDs:

- The unit costs for C02a, C02b, C02c, C03, C04, C05, and C09 are on a per-acre basis. The acreage used to calculate the cost for a given source was assumed to be the acreage associated with the source material in the Bureau of Land Management (BLM) polygon.
- The costs for treatment of leachate (TCDs C04, C06, C07, C08a, and C09) were assumed to be negligible. Infiltration would be minimized with the cap design, and little leachate would be anticipated. Therefore, the cost of leachate treatment should be negligible in comparison to the cost of the repository.
- Hauling costs were calculated on a site-by-site basis. For the local waste consolidation area (TCD C07), hauling costs are included in the TCD and assume a haul distance of one half-mile. For the repository (TCD C08a), hauling costs are not included in the TCD. A hauling TCD, HAUL-2, was developed for the 2001 FS and was applied along with TCD C08a assuming a haul distance of 5 miles for all sites.
- The costs for the disposal of waste at the repository (C08a) were developed for various repository sizes. Based on work conducted by the repository siting team, the costs for the smallest repository, C08a, of 1 million cubic yards (CY) were used. Costs from the 2001 FS Report were adjusted to remove the geosynthetic clay liner and increase the drainage layer flexible membrane liner (FML) from 60 to 80 mils.
- Road costs were applied as 15 percent of the total direct capital cost for each alternative.

D.1.2 Water Collection, Conveyance, and Management TCDs

TCDs C10, PIPE-1, PIPE-2, and PIPE-3 were retained from the 2001 FS Report, and the costs were escalated as described above. Additional TCDs were developed for actions that the TCDs retained from the 2001 FS Report did not address or needed modifications to address site needs. These include TCDs PIPE-4, C11a through C11j, PRESSURE-PIPE-1 through PRESSURE-PIPE-4, C14a through C14c, C15a through C15d, C17a through C17e, C18, C19, C20, and PUMP-1 through PUMP-5. Detailed descriptions of these TCDs can be found in Section 5.2.2 and Table 5-1 in the FFS Report.

Piping TCDs design was based on maximum flow, which increased pipe size from the 2001 FS Report. In addition, several sites designated for passive water treatment in the 2001 FS Report were included in active treatment for this FFS Report.

The cost for TCD C11a-j, Hydraulic Isolation Using Cutoff Wall, is based on the length of the wall required for hydraulic isolation. If the hydraulic isolation cutoff wall is required for both sides of the river/stream, then the length of the river/stream must be doubled to calculate the cost.

The costs for liners (TCDs C14a through C14e) are based on the average width of the river/stream over the application length of each liner.

The costs for French drains (TCDs C15a through C15d) are based on the flows developed by groundwater modeling.

Pump station TCD costs were developed based on a CH2M HILL Parametric Cost Estimating System (CPES) model. Direct unit costs based on varying flow rates are presented in Table D-2b.

D.1.3 Water Treatment TCDs

Attachment D-1 describes the active treatment TCD WT01. An additional sludge pond cost was developed to support WT01 and applied on an alternative basis. The capital cost was linearized depending on the required size of the sludge pond. Section 5.0 of the FFS Report describes the pond in detail.

All of the semi-passive treatment TCDs (WT02, WT03, WT04a, and WT04b) were newly developed for the FFS.

The costs for WT02 (Semi-Passive Lime Treatment) and WT03 (Semi-Passive SRB [sulfate-reducing bioreactor] Treatment) are based on flow (gallons per minute [gpm]). Detailed direct capital and O&M costs were developed for flows of 5 gpm, 50 gpm, and 1,000 gpm. These costs were then graphed and linearized. The linear equations were then used to calculate both direct capital and O&M costs for the site flows.

A bypass and emergency channel system was put in place for WT02 and WT03 to prevent flooding of the systems.

For WT02 (Semi-Passive Lime Treatment), the lime feed storage system cost was based on a quote by Aquafix. There are multiple options for the size of the lime feed storage and dispenser. The appropriate size of equipment was chosen based on the lime demand for that size flow. Winter weather was accounted for by adding a propane tank to heat the building containing the lime feed system. It is assumed that the settling ponds would be dredged every 10 years.

For WT03 (Semi-Passive SRB Treatment), the SRB ponds were assumed to include 75 percent stable waste and 25 percent lime. It is assumed that the media would be replaced every 15 years.

TCDs WT04a and WT04b (both SR-PRB [sulfate-reducing permeable reactive barrier] Treatment) were designed based on the depth of the media. WT04a assumes a media depth of 10 feet, which begins at 5 feet below ground surface (bgs). WT04b assumes a media depth of 40 feet, which begins at 5 feet bgs. These depths were chosen in order to apply these TCDs to different depths of confining layers. The media are assumed to be 75 percent stable waste and 25 percent lime. It is assumed that the media would be replaced every 15 years. Both TCDs assume a length of 100 feet and a width of 7.5 feet.

For both semi-passive and active water treatment, cost calculations for direct capital cost were based on maximum flow, while the O&M costs were based on average flow. If the average flow at a site was known, but the maximum flow was unknown, the maximum flow was assumed to be twice the average flow. In cases where no flow data was available, the average flow was assumed to be 0.1 cubic foot per second (cfs) and the maximum flow was assumed to be 0.2 cfs.

D.1.4 Human Health TCDs

All of the human health TCDs were retained from the 2001 FS Report, and the costs were escalated as described above.

D.1.5 Stream and Riparian Improvement TCDs

All of the stream and riparian improvement TCDs were retained from the 2001 FS Report, with the exception of CD-SED. Retained TCD costs were escalated as described above. TCD CD-SED was developed in 2007, and no detailed cost breakdown is available (URS, 2007).

D.2 Remedy Protection Costs

This section discusses the assumptions used for developing costs for the remedy protection alternatives evaluated in Section 9.0 of the FFS Report. The remedy protection alternatives include RP-1: No Further Action (Post-Event Response) and RP-2: Modifications to Selected Remedies to Enhance Protectiveness (Remedy Protection Projects). The scope of costs that were completed for these alternatives includes eight communities within the Upper Coeur d'Alene Basin (Pinehurst, Smelterville, Kellogg, Wardner, Osburn, Silverton, Wallace and Mullan) in addition to a less detailed estimate developed for the side gulches.

The approach used for developing costs for these alternatives differed from the TCD approach described above. Detailed hydrologic and hydraulic modeling was conducted, as documented in Appendix G of the FFS Report, to determine (1) the expected damage to the Selected Remedies and subsequent post-event costs for Alternative RP-1, and (2) the capital project costs necessary to mitigate the potential risks posed by flood events for Alternative RP-2. The cost analyses conducted for Section 9.0 are also more detailed than the TCD approach. This detailed approach for Alternatives RP-1 and RP-2 was determined to be more appropriate for developing costs for the remedy protection alternatives because (1) only eight communities were evaluated in detail, and (2) hydrologic and hydraulic modeling allowed sufficient data to create more detailed cost estimates.

D.2.1 Alternative RP-1

The costs for Alternative RP-1 were developed based on the methodology described in Section 9.6.1.1 of the FFS Report. This methodology uses the hydrologic and hydraulic analyses documented in Appendix G to apply costs for the expected annual damage to the Selected Remedies. The 30-year NPV cost was then calculated as the present value of the expected annual damage. Tables D-11 through D-18 include the expected annual damage and 30-year NPV costs for each community.

Although detailed analyses were not conducted for the side gulches, it would be expected that hydrologic and hydraulic trends at the eight Upper Basin communities would be applicable to the side gulches. Table D-19 presents the calculations used to determine the approximate RP-1 costs for the side gulches.

Alternative RP-1 includes costs for post-event response (or "re-remediation") of the protective barriers. These are considered O&M costs. No capital costs are associated with Alternative RP-1.

D.2.2 Alternative RP-2

Alternative RP-2 was developed to enhance the existing Selected Remedies within the eight communities. These enhancements were developed from the list of technologies and process options applicable to remedy protection included in Table 9-4 accompanying Section 9.0 in the FFS Report. Multiple technologies and/or process options were combined and applied to

expected impact areas in each of the communities. The impact areas were developed based on the results of the hydrologic and hydraulic analyses documented in Appendix G. These analyses were also used to determine approximate sizes, lengths, and other quantity measurements to apply to the process options to mitigate the existing risks posed to Selected Remedies during flood and storm events. Detailed descriptions (including figures) of the process options applied for each community are included in Attachment G-3 of Appendix G.

Based on the information included in Attachment G-3, cost estimates were developed for each community. Tables D-20 through D-35 present the detailed unit costs for the process options applied to each community, and a summary by community of the costs to mitigate damage to the Selected Remedies. Based on existing conditions, assumptions were made to support development of the detailed unit costs. It was assumed that the remedy protection projects would be implemented during the dry season and minimal dewatering would be necessary during construction. Unit costs assume that all excavated material would be disposed of at a repository (similar to TCD C08a).

O&M costs were also included for Alternative RP-2 on a community basis. Costs for O&M include inspections, repairs, and documentation. These costs were assumed to be 2 percent of the capital costs for Alternative RP-2 annually.

As discussed in Section 9.0, an approximate cost for Upper Basin side gulches was developed for Alternative RP-2. The side gulch cost is approximate because detailed hydrologic and hydraulic modeling was not conducted for these areas. This cost was based on a typical side gulch, which assumes average characteristics based on the side gulches included in Table 9 in Appendix G. Table D-36 presents the methods used to develop the total approximate Alternative RP-2 cost for the side gulches.

D.3 Site-by-Site Costs for Alternatives 3+ and 4+

Because of the large number of sites involved, a relational database was developed to compile quantity and unit cost data, identify TCDs, and calculate costs on a site-by-site and alternative-by-alternative basis. For each waste type at each source, quantity data including the volume, acreage, linear feet, volumetric flow rate, and metals concentration, were input into the database. The TCD(s) identified to remediate each waste type at each source were input for each alternative. The unit cost data for the TCDs were input into the database. The quantity and unit cost data were used by the database to calculate the direct capital, indirect capital, and net present value costs.

Costs were calculated for Alternative 3+ and Alternative 4+. Tables D-37 and D-38 present the estimated costs for each site included in Alternatives 3+ and 4+, respectively, broken out by waste type (trait) and TCD. Tables D-39 and D-40 present the total estimated costs by site for Alternatives 3+ and 4+, respectively. Table D-41 presents the total estimated costs for each watershed under the two alternatives. Rolled-up costs for each alternative are presented in Table 8-3 in the FFS Report.

D.4 References

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Tables

TABLE D-1

Detailed Unit Cost Estimate for Source Control TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
C01	**Excavation**	**1**	**CY**	**$4.20**	
	Excavate	1	CY	$4.20	hydraulic excavator @ 100cy/hr
C01b	**Sediment Excavation (Composite)**	**1**	**CY**	**$13.23**	Assumes 60% excavation above and 40% below water table, backfill 25% of excavated sediment; NEW
	Excavate in dry			$2.19	60%; cost by others
	Excavate below water table			$5.99	40%; cost by others, with excavator or dredge?
	Replace excavated sediment			$5.05	25%; cost by others
C02a	**Regrade/Consolidate/Revegetate**	**1**	**AC**	**$84,281.47**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	1,613	CY	$16.66	based on CIA estimate
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Miscellaneous	1	LS	$5,513.74	slope protection, erosion control, etc
C02b	**Regrade/Consolidate/Revegetate**	**1**	**AC**	**$166,906.76**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	20,973	CY	$5.98	assume 13' deep
	Vegetative Cover	1,613	CY	$16.66	based on CIA estimate
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Miscellaneous	1	LS	$10,919.13	slope protection, erosion control, etc
C02c	**Regrade/Consolidate/Revegetate**	**1**	**AC**	**$14,900.00**	per 2007 Cost Update Memo; No detail available
C03	**Low-Permeability Cap**	**1**	**AC**	**$224,826.10**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	2,420	CY	$19.55	over geotextile
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Native Soil Leveling Layer Placement	807	CY	$11.59	50cy/hr production, depth of 0.5'; description & quantity change only, same cost
	Drainage Layer Placement	1,613	CY	$11.59	50cy/hr production
	Haul Above Material	2,420	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,420	CY	$3.43	allowance per CY for mining development & closure
	GCL	4,840	SY	$5.86	Bunker Hill estimates; added line item, previous cost
	16oz Geotextile	4,840	SY	$2.68	quote for CIA plus installation
	Miscellaneous	1	LS	$14,708.25	slope protection, erosion control, etc
C04	**Low-Perm Cap w/Seepage Collection**	**1**	**AC**	**$254,029.64**	per Draft Tech Memo 1 dated 1/00
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	2,420	CY	$19.55	over geotextile
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Native Soil Leveling Layer Placement	807	CY	$11.59	50cy/hr production, depth of 0.5'

TABLE D-1

Detailed Unit Cost Estimate for Source Control TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Drainage Layer Placement	1,613	CY	$11.59	50cy/hr production
	Haul Above Material	2,420	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,420	CY	$3.43	allowance per CY for mining development & closure
	GCL	4,840	SY	$5.86	Bunker Hill estimates
	16oz Geotextile	4,840	SY	$2.68	quote for CIA plus installation
	Groundwater Collection & Diversion Trench	**2,500**	**SF**	**$10.92**	**Size: 3'w x 10'd Length Variable=**
	Soil Excavation	241	CY	$8.40	boulders, cobbles, etc
	Rock Excavation	56	CY	$41.99	earthwork crew @ 10cy/hr-assume can be excavated w/backhoe
	Shoring (trench box)	250	LF	$2.72	trench box
	Waste	296	CY	$6.86	dispose on tailings pile
	Dewatering	250	LF	$6.79	allowance for sumps & pumps
	4" CPE Pipe	250	LF	$4.15	
	Drain Rock	296	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Geotextile	333	SY	$2.68	quote for CIA plus installation
	60mil FML	333	SY	$10.08	100sy/hr
	Miscellaneous	1	LS	$16,618.76	slope protection, erosion control, etc
C05	**Low-Permeability Cap w/Erosion Protection**	**1**	**AC**	**$252,170.08**	per Draft Tech Memo 1 dated 1/00
	Site Preparation	1	AC	$3,324.79	clearing, grubbing
	Regrade Waste Rock	8,067	CY	$5.98	assume 5' deep
	Vegetative Cover	2,420	CY	$19.55	over geotextile
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Hydroseed	4,840	SY	$0.41	from Bunker Hill estimates
	Native Soil Leveling Layer Placement	807	CY	$11.59	50cy/hr production, depth of 0.5'
	Drainage Layer Placement	1,613	CY	$11.59	50cy/hr production
	Haul Above Material	2,420	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,420	CY	$3.43	allowance per CY for mining development & closure
	GCL	4,840	SY	$5.86	Bunker Hill estimates
	16oz Geotextile	4,840	SY	$2.41	
	Riprap Toe	296	CY	$43.96	assume 10'w x 2' d
	Miscellaneous	1	LS	$27,018.22	slope protection, erosion control, etc
C06	**Waste Consolidation Area w/Erosion Protection**	**40,333**	**CY**	**$15.72**	per Draft Tech Memo 1 dated 1/00
	Haul to On-site Containment	40,333	CY	$1.56	loader to nearby repository, assume 25' deep
	Site Preparation	1	AC	$3,324.79	clearing, grubbing
	Grade at Repository	40,333	CY	$2.07	1-dozer @ 100cy/hr
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Groundwater Collection & Diversion Trench	**3,000**	**SF**		**Size: 3'w x 10'd Variable=**
	Soil Excavation	289	CY	$8.40	boulders, cobbles, etc
	Rock Excavation	67	CY	$41.99	earthwork crew @ 10cy/hr-assume can be excavated w/backhoe

TABLE D-1

Detailed Unit Cost Estimate for Source Control TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Shoring (trench box)	300	LF	$2.72	trench box
	Waste	356	CY	$6.86	dispose on tailings pile
	Dewatering	300	LF	$6.79	allowance for sumps & pumps
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	356	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Geotextile	400	SY	$2.68	quote for CIA plus installation
	60mil FML	400	SY	$10.08	100sy/hr
	Rock Pad	**0.8**	**AC**		assume 80% of cap area
	Geotextile	7,744	SY	$2.41	
	Low Permeability Native Soil Placement	1,291	CY	$11.59	50cy/hr production
	Drainage Layer Placement	2,581	CY	$11.59	50cy/hr production
	Haul Above Material	3,872	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	3,872	CY	$3.43	allowance per CY for mining development & closure
	Toe Drain for Rock Pad	**300**	**LF**		
	Excavation	267	CY	$4.20	earthwork crew @ 100cy/hr
	Waste	4,172	CY	$6.86	dispose on tailings pile
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	267	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	60mil FML	333	SY	$10.08	100sy/hr
	Cap	**1.20**	**AC**		assumed acreage=
	GCL Liner	5,808	SY	$5.97	Bunker Hill estimates
	60mil FML		SY		Bunker Hill estimates
	Vegetative Cover	2,904	CY	$19.55	over geotextile
	Hydroseed	5,808	SY	$0.41	from Bunker Hill estimates
	Low Permeability Native Soil Placement	968	CY	$11.59	50cy/hr production
	Drainage Layer Placement	1,936	CY	$11.59	50cy/hr production
	Haul Above Material	2,904	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,904	CY	$3.43	allowance per CY for mining development & closure
	16oz Geotextile	5,808	SY	$2.68	quote for CIA plus installation
	Riprap Toe	296	CY	$43.96	assume 10'w x 2' d
	Miscellaneous	1	LS	$67,953.46	anchor trenches, slope protection, erosion control, etc
C07	**Waste Consolidation Area Above Flood Level**	**40,333**	**CY**	**$14.68**	per Draft Tech Memo 1 dated 1/00
	Haul to On-site Containment	40,333	CY	$1.56	loader to nearby repository, assume 25' deep
	Site Preparation	1	AC	$3,324.79	clearing, grubbing
	Grade at Repository	40,333	CY	$2.07	1-dozer @ 100cy/hr
	Grade Surface Drainage Ditch	400	CY	$4.15	assume 400' & 1cy/LF
	Groundwater Collection & Diversion Trench	**3,000**	**SF**	**$10.92**	**Size: 3'w x 10'd Variable=**
	Soil Excavation	289	CY	$8.40	boulders, cobbles, etc

TABLE D-1

Detailed Unit Cost Estimate for Source Control TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Rock Excavation	67	CY	$41.99	earthwork crew @ 10cy/hr-assume can be excavated w/backhoe
	Shoring (trench box)	300	LF	$2.72	trench box
	Waste	356	CY	$6.86	dispose on tailings pile
	Dewatering	300	LF	$6.79	allowance for sumps & pumps
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	356	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Geotextile	400	SY	$2.68	quote for CIA plus installation
	60mil FML	400	SY	$10.08	100sy/hr
	Rock Pad	**0.8**	**AC**		assume 80% of cap area
	Geotextile	7,744	SY	$2.68	quote for CIA plus installation
	Low Permeability Native Soil Placement	1,291	CY	$11.59	50cy/hr production
	Drainage Layer Placement	2,581	CY	$11.59	50cy/hr production
	Haul Above Material	3,872	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	3,872	CY	$3.43	allowance per CY for mining development & closure
	Toe Drain for Rock Pad	**300**	**LF**		
	Excavation	266.67	CY	$4.20	earthwork crew @ 100cy/hr
	Haul Above Material	266.67	CY	$6.86	assume 5 mile one way - 5 trucks
	4" CPE Pipe	300	LF	$4.15	
	Drain Rock	266.67	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	60mil FML	333.33	SY	$10.08	100sy/hr
	Cap	**1.2**	**AC**	**$160,721.13**	assumed size w/area adjustment for slopes
	GCL Liner	5,808	SY	$5.97	Bunker Hill estimates
	60mil FML		SY		Bunker Hill estimates
	Vegetative Cover	2,904	CY	$19.55	over geotextile
	Hydroseed	5,808	SY	$0.41	from Bunker Hill estimates
	Low Permeability Native Soil Placement	968	CY	$11.59	50cy/hr production
	Drainage Layer Placement	1,936	CY	$11.59	50cy/hr production
	Haul Above Material	2,904	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	2,904	CY	$3.43	allowance per CY for mining development & closure
	16oz Geotextile	5,808	SY	$2.68	quote for CIA plus installation
	Riprap Toe	0	CY	$43.96	assume 10'w x 2' d
	Miscellaneous	1	LS	$63,426.69	anchor trenches, slope protection, erosion control, etc
C08a	**Repository, 1 million cy**	**1,000,000**	**CY**	**$17.68**	**assume 900' sq & 75' high**
	Haul to Repository	**0**	CY	$0.00	Not included in repository cost since distance is yet unknown
	Transfer at Repository	1,000,000		$1.36	
	Grade & Compact at Repository	1,000,000	CY	$2.07	1-dozer @ 100cy/hr
	Access Road	1	MI	$679,000.00	
	Liner	**19**	**AC**	**$3,618,745.71**	

TABLE D-1

Detailed Unit Cost Estimate for Source Control TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Site Preparation	19	AC	$3,324.79	clearing, grubbing
	Grade base for drainage (CNS)	45,093	CY	$5.08	
	Drainage Layer	60,000	CY	$11.59	hauled in from elsewhere, over geotextile
	Haul Above Material	60,000	CY	$13.73	recent site information, based on 10 mi one way
	Develop & Close Pit for Material Above	60,000	CY	$3.43	allowance per CY for mining development & closure
	GCL Liner	0	SY	$5.97	Bunker Hill estimates - DELETED ON 12/01/09
	80mil FML	90,000	SY	$8.63	CHANGED ON 12/01/09
	Geotextile	90,000	SY	$2.68	quote for CIA plus installation
	Drain Rock	1,100	CY	$44.67	Every 300 ft
	Drain Pipe	3,600	LF	$4.15	
	Strip drains	810,000	SF	$0.48	100% of area
	Compacted Native Soil	0	CY	$5.79	
	Leachage Collection System	1	LS	$100,000.00	ALLOWANCE ADDED ON 12/01/09
	Perimeter Drain & Rock Berm	**3,600**	**LF**		
	Drain Pipe	3,600	LF	$4.15	
	Drain Rock	5,333	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Trench Liner	5,200	SY	$7.42	Bunker Hill estimates
	Rock Berm	43,333	CY	$43.96	assume full perimeter, 10' high x 32.5' average width
	Collection Sump & Gravity Pipeline	1	LS	$45,516.42	ALLOWANCE ADDED ON 12/01/09, ASSUMES 1000' OF 6" HDPE
	Cap	**22.31**	**AC**	**$6,082,768.64**	slope area increase factor of 1.2
	Subgrade Preparation	108,000	SY	$0.21	top of existing pile or site of new pile
	GCL Liner	0	SY	$5.97	Bunker Hill estimates - DELETED ON 12/01/09
	80mil FML	108,000	SY	$8.63	CHANGED ON 12/01/09
	Geotextile	108,000	SY	$2.68	quote for CIA plus installation
	Strip drains	81,000	SF	$0.48	10% of area
	Drainage Layer	36,000	CY	$11.59	hauled in from elsewhere, over geotextile
	Compacted Native Soil	36,000	CY	$5.79	
	Interim cover	100,000	CY	$5.79	10% of volume
	Haul Above Material	172,000	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	172,000	CY	$3.43	allowance per CY for mining development & closure
	Vegetative Cover	36,000	CY	$16.66	based on CIA estimate, REVISED TO 1' ON 12/01/09
	Hydroseed	108,000	SY	$0.41	from Bunker Hill estimates
	Misc Work	1	LS	$1,607,085.73	anchor trenches, slope protection, erosion control, etc
C09	**Impoundment Closure**	**67**	**AC**	**$245,945.54**	**based on Hecla-Star 5800'x 500' x 35' high**
	Perimeter Drain	**12,600**	**LF**	**$32.25**	
	Excavation	16,333	CY	$8.40	assume added volume for boulders, cobbles, etc
	Waste	16,333	CY	$6.86	assume 20% volume of bentonite
	Trench Liner	16,800	SY	$5.97	Bunker Hill estimates

TABLE D-1

Detailed Unit Cost Estimate for Source Control TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Drain Pipe	12,600	LF	$4.15	
	Drain Rock	2,800	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Cap	**73.23**	**AC**	**$216,393.23**	**x 1.1 area increase factor for slopes**
	Regrade Tailings Pile Top	107,407	CY	$2.07	1-dozer @ 100cy/hr, assume 1' average depth
	Regrade Tailings Side Slopes	425,000	CY	$2.07	1-dozer @ 100cy/hr, from 1.5:1 slope to 3:1 slopes
	GCL Liner	354,444	SY	$5.97	Bunker Hill estimates
	60mil FML		SY	$7.42	Bunker Hill estimates
	Geotextile	354,444	SY	$2.68	quote for CIA plus installation
	Drainage Layer	118,148	CY	$11.59	hauled in from elsewhere, over geotextile
	Compacted Native Soil	118,148	CY	$5.79	
	Haul Above Material	236,296	CY	$13.73	this & following item, Sue Alvarez information, based on 10mi one way
	Develop & Close Pit for Material Above	236,296	CY	$3.43	allowance per CY for mining development & closure
	Vegetative Cover	236,296	CY	$16.66	based on CIA estimate
	Hydroseed	354,444	SY	$0.41	Bunker Hill estimates
	Misc Work	1	LS	$1,488,525.89	anchor trenches, slope protection, erosion control, etc
HAUL-2	**Haul to Repository**	**1**	**CY-MI**	**$1.10**	1 - 10cy truck, at 25mph average, plus return trip
	Haul to Repository	1	CY	$1.10	25x10=250, 1/250=.004 x 2=.008

Notes:

AC = acre(s)
CIA = Central Impoundment Area
CPE = polyethylene
CY = cubic yards
FML = flexible membrane liner
GCL = geosynthetic clay liner
LF = linear feet
LS = lump sum
SY = square yards
TCD = typical conceptual design

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
C10	**Adit Drainage Collection**	**1**	**LS**	**$9,684.18**	per DTM 1 dated 1/00, conveyance pipe included elsewhere
	Steel Bars	12	EA	$414.74	assume 6" spacing & 1" dia x 7'long drilled & grouted
	Concrete Wall	1	CY	$1,872.29	incl forms, rebar & concrete
	Drain pipe, stainless	5	LF	$119.94	4" diameter
	Misc Work	1	LS	$2,235.27	flanges, grout, waste, pipe penetration, temporary drainage, etc
C11a	**Hydraulic Isolation Using Slurry Wall, 15'd x 3'w**	**1**	**LF**	**$195.60**	
	Soil Bentonite Mix (10%), 20'd x 3'w	15	SF	$144.60	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	15	SF	$51.00	
C11b	**Hydraulic Isolation Using Slurry Wall, 20'd x 3'w**	**1**	**LF**	**$260.80**	
	Soil Bentonite Mix (10%), 20'd x 3'w	20	SF	$192.80	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	20	SF	$68.00	
C11c	**Hydraulic Isolation Using Slurry Wall, 30'd x 3'w**	**1**	**LF**	**$391.20**	
	Soil Bentonite Mix (10%), 20'd x 3'w	30	SF	$289.20	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	30	SF	$102.00	
C11d	**Hydraulic Isolation Using Slurry Wall, 40'd x 3'w**	**1**	**LF**	**$521.60**	
	Soil Bentonite Mix (10%), 20'd x 3'w	40	SF	$385.60	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	40	SF	$136.00	
C11e	**Hydraulic Isolation Using Slurry Wall, 45'd x 3'w**	**1**	**LF**	**$594.90**	
	Soil Bentonite Mix (10%), 45'd x 3'w	45	SF	$441.90	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	45	SF	$153.00	
C11f	**Hydraulic Isolation Using Slurry Wall, 50'd x 3'w**	**1**	**LF**	**$652.00**	
	Soil Bentonite Mix (10%), 50'd x 3'w	50	SF	$482.00	for 1 slurry wall only from C11 retained TCD cost
	Waste all Excavated Material to Repository	50	SF	$170.00	
C11g	**Hydraulic Isolation Using Slurry Wall, 50'd x 10'wide**	**1**	**LF**	**$4,175.00**	
	Soil Cement Mix (10%), 50'd x 10'wide	50	SF	$4,005.00	revised to cement w/clamshell, 8/11/09 - revised to 10' thick 9/23/09
	Waste all Excavated Material to Repository	50	SF	$170.00	
C11h	**Hydraulic Isolation Using Slurry Wall, 15' BGS w/Fre**	**1**	**LF**	**$1,116.29**	**per Draft Tech Memo 1 dated 1/00**
	GW Barrier (Soil/Bentonite Slurry)	**1**	**LF**	$173.86	
		15	**SF**	$11.59	per Draft Tech Memo #1 dated 1/17/00 - 30'd x 3'thick x variable=
	Excavation	2.22	CY	$8.40	assume added volume for boulders, cobbles, etc
	Rock Excavation	0.22	CY	$41.99	rock will be waste
	Haul & Dispose at Repository	2.22	CY	$5.49	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2.22	CY	$17.70	use C8a cost
	Bentonite Material	0.24	TN	$203.70	1 ton/cy
	Mix & Place Bentonite/Soil	2.44	CY	$11.11	add $2 for mixing
	Miscellaneous	1	LS	$17.37	
	French Drain	**1**	**LF**		
	15' Deep French Drain	1	LF	$942.43	see detail for C15b
C11i	**Hydraulic Isolation Using Slurry Wall, 20' BGS w/Fre**	**1**	**LF**	**$1,210.81**	**per Draft Tech Memo 1 dated 1/00**
	GW Barrier (Soil/Bentonite Slurry)	**1**	**LF**	$225.70	
		20	**SF**	$11.29	per Draft Tech Memo #1 dated 1/17/00 - 30'd x 3'thick x variable=
	Excavation	2.96	CY	$8.40	assume added volume for boulders, cobbles, etc
	Rock Excavation	0.22	CY	$41.99	rock will be waste
	Haul & Dispose at Repository	2.96	CY	$5.49	assume all wasted, 5 mile, use HAUL-2 cost

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Repository Cost	2.96	CY	$17.70	use C8a cost
	Bentonite Material	0.32	TN	$203.70	1 ton/cy
	Mix & Place Bentonite/Soil	3.19	CY	$11.11	add $2 for mixing
	Miscellaneous	1	LS	$22.51	
	French Drain	**1**	**LF**		
	20' Deep French Drain	1	LF	$985.10	see detail for C15c
C11j	**Hydraulic Isolation Using Slurry Wall, 30' BGS w/Fre**	**1**	**LF**	**$1,586.14**	**per Draft Tech Memo 1 dated 1/00**
	GW Barrier (Soil/Bentonite Slurry)	**1**	**LF**	$329.41	
		30	**SF**	$10.98	per Draft Tech Memo #1 dated 1/17/00 - 30'd x 3'thick x variable=
	Excavation	4.44	CY	$8.40	assume added volume for boulders, cobbles, etc
	Rock Excavation	0.22	CY	$41.99	rock will be waste
	Haul & Dispose at Repository	4.44	CY	$5.49	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	4.44	CY	$17.70	use C8a cost
	Bentonite Material	0.47	TN	$203.70	1 ton/cy
	Mix & Place Bentonite/Soil	4.67	CY	$11.11	add $2 for mixing
	Miscellaneous	1	LS	$32.79	
	French Drain				
	30' Deep French Drain	1	LF	$1,256.73	see detail for C15d
C14a	**Stream Lining 10' wide**	**1**	**LF**	**$318.46**	**10' wide bottom width channel**
	Diversion/Care of Water	1	LF	$20.00	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	1	LF	$37.41	Temporary piping allowance; may be in segments
	Excavate & Prep Channel	2	CY	$20.49	50cy/hr
	Haul & Dispose at Repository	2	CY	$13.42	assume all but rock is wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2	CY	$43.27	use C8a cost
	12" Quarry Spalls	1	CY	$29.95	native, include loading & hauling
	Pea Gravel	1	CY	$45.15	imported
	Sand	1	CY	$45.15	imported
	Liner/Geotextile System	5	SY	$39.82	incl anchor trench
	Misc Detail Allowance	10%	LS	$23.80	road maint & repair, testing, detection tape, etc
C14b	**Stream Lining - 20' wide**	**1**	**LF**	**$505.10**	**20' wide bottom width channel**
	Diversion/Care of Water	1	LF	$10.00	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	1	LF	$26.73	Temporary piping allowance; may be in segments
	Excavate & Stockpile Riprap	3	CY	$49.67	25cy/hr
	Excavate & Prep Channel	3	CY	$24.84	50cy/hr
	Haul & Dispose at Repository	3	CY	$16.27	assume all but rock is wasted, 5 mile, use HAUL-2 cost
	Repository Cost	3	CY	$52.44	use C8a cost
	Replace Stockpiled Riprap	3	CY	$73.87	native, include loading & hauling
	Pea Gravel	1	CY	$82.10	imported
	Sand	1	CY	$82.10	imported
	Liner/Geotextile System	6	SY	$47.41	incl anchor trench
	Misc Detail Allowance	10%	LS	$39.67	road maint & repair, testing, detection tape, etc
C14c	**SFCDR Lining - 100' wide**	**1**	**LF**	**$2,969.53**	**100' wide bottom width channel**
	Diversion/Care of Water	1	LF	$50.00	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping	1	LF	$58.58	Temporary piping allowance; may be in segments

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Excavate & Prep Channel	24	CY	$198.68	50cy/hr, 6' deep
	Excavate & Sort Existing Rock	9	CY	$99.86	50cy/hr + screening allowance
	Haul & Dispose at Repository	19	CY	$104.11	assume all but rock is wasted, 5 mile, use HAUL-2 cost
	Repository Cost	19	CY	$335.64	use C8a cost
	Riprap	19	CY	$778.53	48" thick
	Pea Gravel	5	CY	$262.72	imported
	Sand	5	CY	$262.72	imported
	Native Rock, Screened	5	CY	$94.56	excavated material
	Liner/Geotextile System	15	SY	$261.69	incl anchor trench, 80mil PVC & 16oz geotex, allowance
	Additional Mob & Demob Required	5	EA	$250.71	
	Misc Detail Allowance	10%	LS	$211.75	TESC etc.
C15a	**French Drain, 10' DEEP, 14" PIPE**	**1**	**LF**	**$545.41**	**10' deep avg depth, valve vault @1000', SEE OU2 FILE FOR QUANTITIES**
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	2	CY	$6.31	
	Bed & Zone	0.3	CY	$14.87	1/2 mile one way average
	Locally Obtained Backfill Material	1	CY	$17.38	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	0	CY	$7.18	
	Haul & Dispose at Repository	2	CY	$8.27	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2	CY	$26.66	use C8a cost
	Filter Fabric Wrap	21	SF	$24.76	
	Trench Shoring - 25' avg depth	20	SF	$288.50	Solid shoring
	Dewatering: Two Sump Pmps	0.1	HR	$2.08	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 14" HDPE, SDR 26 - Perforated	1	LF	$54.39	200'/day
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$46.41	road maint & repair, testing, detection tape, etc
C15b	**French Drain, 15' DEEP, 18" PIPE**	**1**	**LF**	**$907.04**	**10' deep avg depth, valve vault @1000', SEE OU2 FILE FOR QUANTITIES**
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	2	CY	$9.31	
	Bed & Zone	0.3	CY	$16.01	1/2 mile one way average
	Locally Obtained Backfill Material	1	CY	$27.37	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	0.46	CY	$11.31	
	Haul & Dispose at Repository	2	CY	$12.20	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	2	CY	$39.33	use C8a cost
	Filter Fabric Wrap	24	SF	$27.60	
	Trench Shoring - 25' avg depth	40	SF	$567.55	Solid shoring
	Dewatering: Two Sump Pmps	0.1	HR	$3.07	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 18" HDPE, SDR 26 - Perforated	1	LF	$66.92	180'/day
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$77.77	road maint & repair, testing, detection tape, etc
C15c	**French Drain, 20' DEEP, 18" PIPE**	**1**	**LF**	**$949.24**	**10' deep avg depth, valve vault @1000', SEE OU2 FILE FOR QUANTITIES**

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	3	CY	$12.42	
	Bed & Zone	0.3	CY	$16.01	1/2 mile one way average
	Locally Obtained Backfill Material	2	CY	$38.47	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	1	CY	$15.89	
	Haul & Dispose at Repository	3	CY	$16.27	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	3	CY	$52.44	use C8a cost
	Filter Fabric Wrap	26	SF	$30.54	
	Trench Shoring - 25' avg depth	40	SF	$567.55	Solid shoring
	Dewatering: Two Sump Pmps	0.2	HR	$4.09	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 18" HDPE, SDR 26 - Perforated	1	LF	$66.92	180'/day
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$80.05	road maint & repair, testing, detection tape, etc
C15d	**French Drain, 25' DEEP, 24" PIPE**	**1**	**LF**	**$1,210.16**	**25' deep avg depth, valve vault @1000', SEE OU2 FILE FOR QUANTITIES**
	Clear, Grub & Dispose	0.001	AC	$0.65	
	Excavate Trench	4	CY	$16.14	
	Bed & Zone	0.4	CY	$17.14	1/2 mile one way average
	Locally Obtained Backfill Material	3	CY	$50.67	allow for material loading & preparation
	Imported Backfill - Drain Rock Material (Cobble)	1	CY	$20.93	
	Haul & Dispose at Repository	4	CY	$21.15	assume all wasted, 5 mile, use HAUL-2 cost
	Repository Cost	4	CY	$68.18	use C8a cost
	Filter Fabric Wrap	29	SF	$34.06	
	Trench Shoring - 25' avg depth	52	SF	$737.81	Solid shoring
	Dewatering: Two Sump Pmps	0.2	HR	$5.32	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1	LF	$41.82	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 24" HDPE, SDR 26 - Perforated	1	LF	$88.27	150'/day,
	Cleanouts	0.002	EA	$4.37	allowance
	Restoration - Seeding	0.001	AC	$1.75	subcontract
	Misc Detail Allowance	10%	LS	$101.89	road maint & repair, testing, detection tape, etc
C17a	**EXTRACTION WELL-6" dia x 20' deep**	**1**	**EA**	**$65,722.66**	**6" dia, 20' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$4,729.56	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$3,547.17	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Pipe - Header/Gravity			$0.00	
	Clear & Grub Disposal Site	0.15	AC	$127.00	

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Imported Backfill - n/a	0	CY	$0.00	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$19,915.96	allow
	Misc Detail Allowance	10%	LS	$5,974.79	road maint & repair, testing, detection tape, etc
C17b	**EXTRACTION WELL - 6" dia x 40' deep**	**1**	**EA**	**$68,649.07**	**6" dia, 40' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$6,503.15	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$3,547.17	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Pipe - Header/Gravity			$0.00	
	Clear & Grub Disposal Site	0.15	AC	$127.00	
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Imported Backfill - n/a	0	CY	$0.00	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$20,802.75	allow
	Misc Detail Allowance	10%	LS	$6,240.82	road maint & repair, testing, detection tape, etc
C17c	**EXTRACTION WELL - 6" dia x 50' deep**	**1**	**EA**	**$72,876.48**	**6" dia, 50' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$8,276.73	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$5,911.95	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Pipe - Header/Gravity			$0.00	
	Clear & Grub Disposal Site	0.15	AC	$127.00	
	Pipe - 6" SDR 21 HDPE	200	LF	$5,738.51	
	Tee - Reducing	1	EA	$527.94	
	Bend- 45 deg - allow	2.0	EA	$1,188.69	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Imported Backfill - n/a	0	CY	$0.00	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$22,083.78	allow
	Misc Detail Allowance	10%	LS	$6,625.13	road maint & repair, testing, detection tape, etc
C17d	**EXTRACTION WELL - 10' dia x 50' deep**	**1**	**EA**	**$80,354.73**	**10" dia, 55' deep, sst screen 15', sch 80 pvc casing** (Note while this was developed for 55' foot deep well it is being applied in a 50' deep scenario as the values are similar)
	Well Drilling and Development - Subcontract	1	EA	$11,232.71	Quote plus mark-up
	Pumps - Subcontracted	1	EA	$5,911.95	allow
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Pipe - Header/Gravity			$0.00	
	Clear & Grub Disposal Site	0.15	AC	$127.00	
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Imported Backfill - n/a	0	CY	$0.00	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$24,349.92	allow
	Misc Detail Allowance	10%	LS	$7,304.98	road maint & repair, testing, detection tape, etc
C17e	**EXTRACTION WELL - 10' dia x 70' deep**	**1**	**EA**	**$83,281.15**	**10" dia, 70' deep, sst screen 15', sch 80 pvc casing**
	Well Drilling and Development - Subcontract	1	EA	$13,006.29	interp from above
	Pumps - Subcontracted	1	EA	$5,911.95	allow

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Discharge Piping				
	Pipe at Pump				
	Pipe - 2" SDR 11 HDPE	30	LF	$251.52	
	Bend- 90 deg	2	EA	$214.11	
	Check Valve	1	EA	$463.97	
	Globe Valve	1	EA	$617.68	
	Gate Valve	1	EA	$411.94	
	Insulation Allowance	1	LS	$17,276.03	
	Pipe - Header/Gravity			$0.00	
	Clear & Grub Disposal Site	0.15	AC	$127.00	
	Pipe - 6" SDR 21 HDPE	200	LF	$7,080.05	
	Tee - Reducing	1	EA	$628.55	
	Bend- 45 deg - allow	2.0	EA	$1,322.85	
	Excavate Trench	89	CY	$372.53	
	Bed & Zone	36	CY	$1,728.58	
	Native Backfill	52	CY	$517.10	
	Imported Backfill - n/a	0	CY	$0.00	
	Haul Waste Material	37	CY	$203.70	within 5 mile radius, clean material
	Restoration - Seeding	0.15	AC	$339.58	subcontract
	Electrical Service & Controls Allowance	50%	LS	$25,236.71	allow
	Misc Detail Allowance	10%	LS	$7,571.01	road maint & repair, testing, detection tape, etc
C18	**SFCDR Diversion**	**1**	**EA**	**$881,812.79**	
	Cofferdam Both Sides of Cutoff Wall Excavation	300	LF	$270,000.00	
	Pump Intake Structure	2	EA	$50,000.00	allowance
	Diversion Pump	4	EA	$243,748.27	2 active, 2 standby
	30" HDPE Pipe	200	LF	$24,126.93	asm SDR 17
	Misc Detail Allowance	50%	LS	$293,937.60	TESC, maintenance, etc
C19	**I-90 Crossing**	**1**	**EA**	**$276,096.45**	
	Remove Pavement	433	SY	$9,080.37	sawct, remove, dispose
	Night Work Premium	1	LS	$52,000.00	assume 10%
	Production Loss Adjustment	1	LS	$104,000.00	130LF, % of cutoff wall cost
	Replace Pavement, Striping, etc	433	SY	$21,666.67	assume concrete/ACP
	Traffic Control	1	LS	$52,000.00	
	Misc Detail Allowance	20%	LS	$37,349.41	road maint & repair, lights, plates, patch, etc
C20	**Check Dam**	**1**	**EA**	**$47,897.66**	**assume pyramid 10ft base and 5 ft tall**
	Prepare Location for Check Dam Structure	1	LS	$14,601.84	potential shoring & bracing replacements, etc
	Prep & Clean Surfaces for Mix	1	LS	$5,840.73	remove dirt & debris
	Controlled Density Fill (CDF)	11	CY	$2,251.85	allow for special mix in small quantity, transport, 1:1 slope
	Transport, Setup, Prep Operation	1	LS	$9,000.00	RSM 07/21/29.10, assume $3000/day & 3 days for bulkhead
	Setup & Install CDF	11	CY	$8,220.29	assume hand mix at site
	Misc Detail Allowance	20%	LS	$7,982.94	lighting, ventilation, etc
PIPE-1	**Gravity Pipeline - 6"**	**1**	**LF**	**$58.74**	
	Clear & Grub	3.6	SY	$0.84	
	Excavation	0.43	CY	$20.99	

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Bed & Zone	0.14	CY	$43.31	
	Native Backfill	0.28	CY	$11.59	
	Waste	0.15	CY	$6.86	
	HDPE Pipe	1	LF	$24.12	assume SDR 26 HDPE, 400'/day
	Restoration	3.6	SY	$0.68	road gravel/seeding
	Misc Work	1	LS	$9.79	fittings, valves, testing, startup
PIPE-2	**Gravity Pipeline - 12"**	**1**	**LF**	**$86.16**	
	Clear & Grub	3.8	SY	$0.84	
	Excavation	0.59	CY	$20.99	
	Bed & Zone	0.23	CY	$43.31	
	Native Backfill	0.33	CY	$11.59	
	Waste	0.26	CY	$6.86	
	HDPE Pipe	1	LF	$38.07	assume SDR 26 HDPE, 350'/day
	Restoration	3.8	SY	$0.68	road gravel/seeding
	Misc Work	1	LS	$14.36	fittings, valves, testing, startup
PIPE-3	**Gravity Pipeline - 24"**	**1**	**LF**	**$138.85**	
	Clear & Grub	4.2	SY	$0.84	
	Excavation	1	CY	$20.99	
	Bed & Zone	0.38	CY	$43.31	
	Native Backfill	0.5	CY	$11.59	
	Waste	0.5	CY	$6.86	
	HDPE Pipe	1	LF	$62.65	assume SDR 26 HDPE, 300'/day
	Restoration	4.2	SY	$0.68	road gravel/seeding
	Misc Work	1	LS	$23.14	fittings, valves, testing, startup
PIPE-4	**Gravity Pipeline - 36"**	**1**	**LF**	**$180.00**	Assume 6/10ths rule based on PIPE-3
PRESSURE-PIPE-1	**PRESSURIZED PIPELINE - 3"**	**1**	**LF**	**$44.06**	**3' cover**
	Clear, Grub & Dispose	0.001	AC	$2.96	
	Excavate Trench	0.52	CY	$2.17	
	Bed & Zone	0.16	CY	$7.77	
	Native Backfill	0.36	CY	$3.56	
	Haul Waste Material	0.16	CY	$0.89	within 5 mile radius, clean material
	Trench Safety	1.00	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.00	HR	$0.00	NA
	Pipe, 3" HDPE, SDR 17	1.00	LF	$15.80	500'/day
	Restoration - Seeding	0.0009	AC	$1.98	subcontract
	Misc Detail Allowance	10%	LS	$3.92	fittings, valves, location detection, etc
PRESSURE-PIPE-2	**PRESSURIZED PIPELINE - 6"**	**1**	**LF**	**$82.03**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.54	
	Excavate Trench	0.444	CY	$1.86	
	Bed & Zone	0.178	CY	$8.64	
	Native Backfill	0.259	CY	$2.59	
	Haul Waste Material	0.185	CY	$1.02	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Dewatering: Two Sump Pmps	0.027	HR	$0.32	24 hr operaton x 4 for in stream
	Pipe, 6" HDPE, SDR 17	1.000	LF	$34.07	300'/day
	Pipe, 6" Tee Assembly	0.001	EA	$1.31	
	Pipe, 6" Flange Adapter	0.001	EA	$1.64	
	Pipe, 6" Valve w/ Stem/Box	0.001	EA	$7.12	
	Pipe, 8" Cap	0.001	EA	$0.53	
	Valve Vault Structure	0.001	EA	$6.33	
	Restoration - Seeding	0.001	AC	$1.70	subcontract
	Misc Detail Allowance	10%	LS	$7.37	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-2	**PRESSURIZED PIPELINE - 8"**	**1**	**LF**	**$86.72**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.55	
	Excavate Trench	0.463	CY	$1.94	
	Bed & Zone	0.191	CY	$9.27	
	Native Backfill	0.260	CY	$2.59	
	Haul Waste Material	0.204	CY	$1.12	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.028	HR	$0.33	24 hr operaton x 4 for in stream
	Pipe, 8" HDPE, SDR 17	1.000	LF	$36.44	300'/day
	Pipe, 8" Tee Assembly	0.001	EA	$1.28	
	Pipe, 8" Flange Adapter	0.001	EA	$1.73	
	Pipe, 8" Valve w/ Stem/Box	0.001	EA	$8.06	
	Pipe, 8" Cap	0.001	EA	$0.59	
	Valve Vault Structure	0.001	EA	$6.33	
	Restoration - Seeding	0.001	AC	$1.71	subcontract
	Misc Detail Allowance	10%	LS	$7.78	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-2	**PRESSURIZED PIPELINE - 12"**	**1**	**LF**	**$91.46**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.58	
	Excavate Trench	0.505	CY	$2.11	
	Bed & Zone	0.212	CY	$10.28	
	Native Backfill	0.264	CY	$2.63	
	Haul Waste Material	0.241	CY	$1.32	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.030	HR	$0.36	24 hr operaton x 4 for in stream
	Pipe, 12" HDPE, SDR 17	1.000	LF	$38.21	300'/day
	Pipe, 12" Tee Assembly	0.001	EA	$1.37	
	Pipe, 12" Flange Adapter	0.001	EA	$1.80	
	Pipe, 12" Valve w/ Stem/Box	0.001	EA	$8.89	
	Pipe, 12" Cap	0.001	EA	$0.65	
	Valve Vault Structure	0.001	EA	$6.33	
	Restoration - Seeding	0.001	AC	$1.72	subcontract
	Misc Detail Allowance	10%	LS	$8.19	road maint & repair, testing, detection tape, etc

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
PRESSURE-PIPE-2	**PRESSURIZED PIPELINE - 14"**	**1**	**LF**	**$105.48**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.60	
	Excavate Trench	0.556	CY	$2.33	
	Bed & Zone	0.234	CY	$11.37	
	Native Backfill	0.282	CY	$2.81	
	Haul Waste Material	0.274	CY	$1.51	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.033	HR	$0.40	24 hr operaton x 4 for in stream
	Pipe, 14" HDPE, SDR 17	1.000	LF	$47.56	250'/day
	Pipe, 14" Tee Assembly	0.001	EA	$1.52	
	Pipe, 14" Flange Adapter	0.001	EA	$1.92	
	Pipe, 14" Valve w/ Stem/Box	0.001	EA	$10.19	
	Pipe, 14" Cap	0.001	EA	$0.74	
	Valve Vault Structure	0.001	EA	$6.33	Seventeen structures assumed
	Restoration - Seeding	0.001	AC	$1.74	subcontract
	Misc Detail Allowance	10%	LS	$9.45	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-3	**PRESSURIZED PIPELINE - 18"**	**1**	**LF**	**$176.44**	**single pipe, 30' deep avg depth, valve vault @1000'**
	Clear, Grub & Dispose	0.001	AC	$2.66	
	Excavate Trench	0.667	CY	$2.79	
	Bed & Zone	0.280	CY	$13.61	
	Native Backfill	0.321	CY	$3.20	
	Haul Waste Material	0.346	CY	$1.90	within 5 mile radius, clean material
	Trench Safety	1.000	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.040	HR	$0.92	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1.000	LF	$42.57	allow for 8" above grade HDPE pipe & appurtenances
	Pipe, 18" HDPE, SDR 17	1.000	LF	$62.47	factored from 20"
	Pipe, 18" Tee Assembly	0.001	EA	$1.85	factored from 20"
	Pipe, 18" Flange Adapter	0.001	EA	$2.42	factored from 20"
	Pipe, 18" Valve w/ Stem/Box	0.001	EA	$12.11	factored from 20"
	Pipe, 18" Cap	0.001	EA	$0.97	factored from 20"
	Valve Vault Structure	0.001	EA	$6.33	Seventeen structures assumed
	Restoration - Seeding	0.001	AC	$1.78	subcontract
	Misc Detail Allowance	10%	LS	$15.87	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-3	**PRESSURIZED PIPELINE - 21"**	**1**	**LF**	**$183.12**	**5' cover, valve vault @1000'**
	Clear, Grub & Dispose	0.00	AC	$2.85	
	Excavate Trench	1.20	CY	$5.04	
	Bed & Zone	0.32	CY	$15.35	
	Native Backfill	0.80	CY	$7.95	
	Haul Waste Material	0.41	CY	$2.23	within 5 mile radius, clean material
	Trench Safety	1.00	LF	$5.00	trench box
	Dewatering: Two Sump Pmps	0.07	HR	$1.66	24 hr operation plus redundantt pump, pump to PS drain & to CTP
	Temporary Pipeline to PS Drain & Removal	1.00	LF	$42.57	allow for 8" above grade HDPE pipe & appurtenances

TABLE D-2a

Detailed Unit Cost Estimate for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Pipe, 21" HDPE, SDR 17	1.00	LF	$58.86	300'/day
	Pipe, 21" Tee Assembly	0.00	EA	$1.76	
	Pipe, 21" Flange Adapter	0.00	EA	$2.10	
	Pipe, 21" Valve w/ Stem/Box	0.00	EA	$12.21	
	Pipe, 21" Cap	0.00	EA	$0.86	
	Valve Vault Structure	0.00	EA	$6.33	Seventeen structures assumed
	Restoration - Seeding	0.00	AC	$1.90	subcontract
	Misc Detail Allowance	10%	LS	$16.44	road maint & repair, testing, detection tape, etc
PRESSURE-PIPE-4	**PRESSURIZED PIPELINE IN CHERRY RAISE**	**1**	**LF**	**$154.69**	
	3" HDPE Vertical in Cherry Raise	1	LF	$85.62	SDR 15.5, 80'/day
	Supports & Hangers	1	LF	$5.00	asm 1/5', installation above
	Pipe Chase Improvements	1	LF	$50.00	allowance to replace rotted timbers, etc
	Misc Work	1	LS	$14,062.32	lights, acess, fittings, valves, etc

Notes:

AC = acre(s)
CY = cubic yards
EA = each
HR = hour
LF = linear feet
LS = lump sum
SF = square foot
SY = square yards
TCD = typical conceptual design
TN = ton

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-2b

Detailed Unit Cost Estimate for Pump Station TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Unit	2009 Direct Capital Unit Cost	O&M %
PUMP-1	Pump Station - 0.14 MGD	EA	$29,300.00	100%
PUMP-2	Pump Station - 1.4 MGD	EA	$959,000.00	100%
PUMP-3	Pump Station - 3.9 MGD	EA	$1,025,000.00	100%
PUMP-4	Pump Station - 6.3 MGD	EA	$1,188,000.00	100%
PUMP-5	Pump Station - 6.5 MGD	EA	$1,208,000.00	100%

Notes:

EA = each

MGD = million gallons per day

TCD = typical conceptual design

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-3

Detailed Unit Cost Estimate for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
WT01		**Centralized High-Denisty Sludge Treatment at CTP**				Costs for WT01 are included in Attachment D-1
WT02		**Semi-Passive Lime Treatment (Lineraized Cost)**		gpm	y = 2613x + 258722	O&M %: y = (4254.9x + 997357)/(2613x + 258722)
WT02		**Semi-Passive Lime Treatment**	**5**	**GPM**	**$233,951**	
	5	**Lime Feed System**				
		Clear & Grub	0.50	AC	$2,748	entire area allowance
		Lime Feed/Storage System	1	LS	$21,133	quote + frt & markup [Aquafix]
		Lime	0.25	Ton	$109	quote + frt & markup [Aquafix] This system holds 500 lbs of lime.
		Concrete Pad	6	CY	$3,972	assume 10' sq
		Building over Equipment	100	SF	$20,000	3-sided metal shed, foundation, no lighting
		500-gallon propane tank for heating	1	LS	$2,200	lump sum estimate by Aquafix
		Conveyance Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Settling Ponds and Bypass	**2**	**EA**		
		Cut & Fill	1,180	CY	$24,318	assume balance cut & fill, From design spreadsheet: Volume pond = 2612 cf, Liquid depth = 10 ft., Area (avg) = 261 sf
		Liner Fill	380	CY	$18,042	6" under & over, prorated quantity
		Lining	1,120	SY	$12,661	single 60mil HDPE, prorated quantity
		Site Fencing, Gates & Signage	480	LF	$12,000	subcontract
		Bird Deterrent	1,120	SY	$5,600	subcontract
		6" HDPE Pipeline	230	LF	$15,901	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 30 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two ponds.
		6" Knife Gate Valve & Vault	4	EA	$24,727	
		Effluent and Emergency Channel	**310**	**LF**		This assumes a 50' effluent channel and a 260' (100' conveyance, 60' diameter of ponds, 100' in between ponds - see figure) emergency channel to protect the ponds.
		Excavation	379	CY	$6,449	assume 310' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	379	CY	$908	2 trucks, dispose nearby
		Riprap	264	CY	$13,189	assume 12" thick
		Misc Detail Allowance	20%	LS	$38,117	testing, startup, other TESC, etc

TABLE D-3

Detailed Unit Cost Estimate for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
WT02		**Semi-Passive Lime Treatment**	**50**	**GPM**	**$428,994**	
	50	**Lime Feed System**				
		Clear & Grub	0.50	AC	$2,748	entire area allowance
		Lime Feed/Storage System	1	LS	$29,933	quote + frt & markup
		Lime	2	Ton	$875	quote + frt & markup; This system holds 2 tons of lime.
		Concrete Pad	6	CY	$3,972	assume 10' sq
		Building over Equipment	100	SF	$20,000	3-sided metal shed, foundation, no lighting
		500-gallon propane tank for heating	1	LS	$2,200	lump sum estimate by Aquafix
		Conveyance Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Settling Ponds and Bypass	**2**	**EA**		
		Cut & Fill	4,960	CY	$102,220	assume balance cut & fill
		Liner Fill	840	CY	$39,882	6" under & over
		Lining	2,520	SY	$28,487	single 60mil HDPE
		Site Fencing, Gates & Signage	1,120	LF	$28,000	subcontract
		Bird Deterrent	2,520	SY	$12,600	subcontract
		6" HDPE Pipeline	290	LF	$20,049	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 90 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two ponds.
		6" Knife Gate Valve & Vault	4	EA	$24,727	
		Effluent and Emergency Channel	**430**	**LF**		This assumes a 50' effluent channel and a 380' (100' conveyance, 180' diameter of ponds, 100' in between ponds - see figure) emergency channel to protect the ponds.
		Excavation	526	CY	$8,953	assume 380' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	526	CY	$1,261	2 trucks, dispose nearby
		Riprap	366	CY	$18,280	assume 12" thick
		Misc Detail Allowance	20%	LS	$70,163	testing, startup, other TESC, etc
WT02		**Semi-Passive Lime Treatment**	**1,000**	**GPM**	**$2,869,940**	
	1000	**Lime Feed System**				
		Clear & Grub	1.00	AC	$5,496	entire area allowance
		Lime Feed/Storage System	1	LS	$117,933	quote + frt & markup
		Lime	18	Ton	$7,878	quote + frt & markup

TABLE D-3

Detailed Unit Cost Estimate for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
		Concrete Pad	13	CY	$8,938	assume 15' sq
		Building over Equipment	100	SF	$20,000	3-sided metal shed, foundation, no lighting
		500-gallon propane tank for heating	1	LS	$2,200	lump sum estimate by Aquafix
		Conveyance Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Settling Ponds and Bypass	**2**	**EA**		
		Cut & Fill	63,000	CY	$1,298,359	assume balance cut & fill; Volume pond = 522,413 cf, Liquid depth = 10 ft., Area (avg) = 52,241 sf
		Liner Fill	6,000	CY	$284,871	6" under & over
		Lining	17,900	SY	$202,349	single 60mil HDPE
		Site Fencing, Gates & Signage	4,320	LF	$108,000	subcontract
		Bird Deterrent	17,900	SY	$89,500	subcontract
		12" HDPE Pipeline	590	LF	$86,299	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 390 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two ponds.
		12" Knife Gate Valve & Vault	4	EA	$43,090	allowance
		Bypass System	1	LS	$14,727	pipe, fittings, valves, vaults, etc
		Effluent and Emergency Channel	**1,030**	**LF**		This assumes a 50' effluent channel and a 980' (100' conveyance, 780' diameter of ponds, 100' in between ponds) emergency channel to protect the ponds.
		Excavation	1,259	CY	$21,428	assume 1030' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	1,259	CY	$3,017	2 trucks, dispose nearby
		Riprap	877	CY	$43,822	assume 12" thick
		Misc Detail Allowance	20%	LS	$472,907	testing, startup, other TESC, etc
WT03		**Passive SRB Treatment (Linearized Cost)**		gpm	y = 6482.4x + 132414	O&M %: y = (3012.9x + 526116)/(6482.4x + 132414)
WT03		**Passive SRB Treatment**	**5**	**GPM**	**$164,753**	
	5	**SRB Ponds**	**2**	**EA**		
		Clear & Grub	0.25	AC	$1,374	entire area allowance
		Cut & Fill	264	CY	$5,441	assume balance earthwork;SRB depth = 10 ft, SRB Area = 361 sf
		Liner Fill	170	CY	$8,071	6" under & over

TABLE D-3

Detailed Unit Cost Estimate for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
		Lining	560	SY	$6,330	60mil HDPE
		Stable Waste	203	CY	$7,953	75% of excavation, 0.5TN/CY, quote + markup
		Lime	68	CY	$5,479	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
		Flow Distribution Piping	2	EA	$7,496	allowance
		Passive Aeration Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Aerobic Polishing Pond	**1**	**EA**		
		Cut & Fill	60	CY	$1,237	assume balance earthwork
		Wetland	**1**	**EA**		
		Cut & Fill	10	CY	$2,748	assume balance earthwork
		Wetland Planting	11	SY	$111	cattails, allowance
		Other including bypass				
		Site Fencing, Gates & Signage	600	LF	$15,000	subcontract, assume 1/2 acre
		Bird Deterrent	1,200	SY	$6,000	subcontract, assume 1/4 acre
		6" HDPE Pipeline	270	LF	$18,666	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 70 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two SRB ponds.
		6" Knife Gate Valve & Vault	4	EA	$24,727	
		Effluent and Emergency Channel	**370**	**LF**		assumes a 50' effluent and 320' emergency channel
		Excavation	452	CY	$7,698	assume 320' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	452	CY	$1,084	2 trucks, dispose nearby
		Riprap	315	CY	$15,742	assume 12" thick
		Misc Detail Allowance	20%	LS	$19,362	testing, startup, other TESC, etc
WT03		**Passive SRB Treatment**	**50**	**GPM**	**$456,608**	
	50	**SRB Ponds**	**2**	**EA**		
		Clear & Grub	0.50	AC	$2,748	entire area allowance
		Cut & Fill	1,970	CY	$40,599	assume balance earthwork
		Liner Fill	400	CY	$18,991	6" under & over
		Lining	2,200	SY	$24,870	60mil HDPE
		Stable Waste	2,006	CY	$78,767	75% of excavation, 0.5TN/CY, quote + markup
		Lime	669	CY	$54,264	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
		Flow Distribution Piping	2	EA	$7,496	allowance

TABLE D-3

Detailed Unit Cost Estimate for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code		Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
		Passive Aeration Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick
		Aerobic Polishing Pond	**1**	**EA**		
		Cut & Fill	400	CY	$8,244	assume balance earthwork
		Wetland	**1**	**EA**		
		Cut & Fill	50	CY	$13,739	assume balance earthwork
		Wetland Planting	278	SY	$2,778	cattails, allowance
		Other including bypass				
		Site Fencing, Gates & Signage	800	LF	$20,000	subcontract, assume 1 acre
		Bird Deterrent	2,400	SY	$12,000	subcontract, assume 1/2 acre
		6" HDPE Pipeline	410	LF	$28,345	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 210 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two SRB ponds, polishing pond, and wetland.
		6" Knife Gate Valve & Vault	4	EA	$24,727	
		Effluent and Emergency Channel	**590**	**LF**		assumes a 50' effluent and a 540' emergency channel
		Excavation	721	CY	$12,275	assume 590' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	721	CY	$1,728	2 trucks, dispose nearby
		Riprap	503	CY	$25,102	assume 12" thick
		Misc Detail Allowance	20%	LS	$64,091	testing, startup, other TESC, etc
WT03	**Passive SRB Treatment**		**1,000**	**GPM**	**$6,614,763**	
	1000	**SRB Ponds**	**2**	**EA**		
		Clear & Grub	4.55	AC	$24,980	entire area allowance
		Cut & Fill	60,000	CY	$1,236,532	assume balance earthwork
		Liner Fill	8,000	CY	$379,828	6" under & over
		Lining	22,000	SY	$248,698	60mil HDPE
		Stable Waste	40,101	CY	$1,574,990	75% of excavation, 0.5TN/CY, quote + markup
		Lime	13,367	CY	$1,085,046	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
		Flow Distribution Piping	2	EA	$7,496	allowance
		Passive Aeration Channel	**100**	**LF**		
		Excavation	122	CY	$2,080	assume 100' long, 2'w @ bottom, 3:1 slopes, 3'd
		Waste	122	CY	$293	2 trucks, dispose nearby
		Riprap	85	CY	$4,255	assume 12" thick

TABLE D-3

Detailed Unit Cost Estimate for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Aerobic Polishing Pond	**1**	**EA**		
	Cut & Fill	10,800	CY	$222,576	assume balance earthwork
	Wetland	**1**	**EA**		
	Cut & Fill	600	CY	$164,871	assume balance earthwork
	Wetland Planting	1,202	SY	$12,018	cattails, allowance
	Other including bypass				
	Site Fencing, Gates & Signage	2,000	LF	$50,000	subcontract, assume 6 acre
	Bird Deterrent	24,000	SY	$120,000	subcontract, assume 5 acre
	12" HDPE Pipeline	1,110	LF	$162,359	5' cover; This assumes 100 ft of pipe to the ponds, 100 ft. of pipe between the 2 ponds, and 910 ft of pipe for the bypass. The bypass was determined to be 150% of the diameter of the two SRB ponds.
	12" Knife Gate Valve & Vault	4	EA	$43,090	allowance
	Effluent and Emergency Channel	**1,720**	**LF**		assumes a 50' effluent and a 1670' emergency channel
	Excavation	2,102	CY	$35,784	assume 1720' long, 2'w @ bottom, 3:1 slopes, 3'd
	Waste	2,102	CY	$5,038	2 trucks, dispose nearby
	Riprap	1,465	CY	$73,179	assume 12" thick
	Misc Detail Allowance	20%	LS	$1,044,542	testing, startup, other TESC, etc
WT04a	**SR-PRB Treatment**	**11,250**	**CF**	**$19,522**	
10' Deep	Clear & Grub	0.07	AC	$378	150'x20'
	Excavation	417	CY	$3,546	100'Lx7.5'Wx15'D;PRB will be 10' deep, 5' of excavation on top
	Waste	278	CY	$666	2 trucks, dispose nearby
	Stable Waste	208	CY	$5,066	75% of excavation, 0.5TN/CY, quote + markup
	Lime	69	CY	$6,931	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
	Misc Detail Allowance	15%	LS	$2,488	testing, startup, other TESC, etc
		7,500			100'Lx7.5'Wx10'D This accounts for only the PRB. See 'P11" for entire excavation.
WT04b	**SR-PRB Treatment**	**33,750**	**CF**	**$117,985**	
40' Deep	Clear & Grub	0.17	AC	$946	150'x50'
	Excavation	1,250	CY	$24,300	100'Lx7.5'Wx45'D; PRB will be 40' deep, 5' of excavation on top
	Waste	1,111	CY	$2,663	2 trucks, dispose nearby
	Stable Waste	833	CY	$28,574	75% of excavation, 0.5TN/CY, quote + markup
	Lime	278	CY	$36,352	25% of excavation, 1.25TN/CY, quote + markup, mix in-place
	Misc Detail Allowance	25%	LS	$23,209	testing, startup, other TESC, safety, dewatering, rock issure etc

TABLE D-3

Detailed Unit Cost Estimate for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
		30,000			100'Lx7.5'Wx40'D This accounts for only the PRB. See 'P11" for entire excavation.

Notes:

AC = acre(s)
CY = cubic yards
EA = each
LS = lump sum
SY = square yards

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-4

Detailed Unit Cost Estimate for Human Health TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
HH-2	**Upland Waste Pile Soil Cover**	**1**	**AC**	**$58,443.08**	
	Regrade Waste Rock	4,840	CY	$5.25	assume 5' deep
	Vegetative Cover	1,613	CY	$15.94	based on CIA estimate
	Grade Surface Drainage Ditch	400	CY	$3.78	assume 400' & 1cy/LF
	Hydroseed	4840	SY	$0.41	Bunker Hill estimates
	Miscellaneous	1	LS	$3,823.73	
HH-3	**Millsite Decontamination**		EA	**$135,800.00**	
HH-4	**Millsite Demolition/Disposal**	**100**	**CY**	**$168.60**	
	Demolish and Dispose in Solid Waste Landfill	75	CY	$67.90	
	Disposal of Hazardous Waste	25	TN	$407.40	
	Miscellaneous	1	LS	$1,582.07	

Notes:

AC = acre(s)
CY = cubic yards
EA = each
LS = lump sum
SY = square yards
TCD = typical conceptual design

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-5

Detailed Unit Cost Estimate for Stream and Riparian Improvement TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
CD-1	**Current Deflector-Groynes (Spur Dikes, Spurs)**	**1**	**EA**	**$2,005.22**	high end of cost range
	Rock	3	EA	$135.80	
	Log	3	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$182.29	stream diversion, eros/sed control, etc
CD-2	**Current Deflector-Bank Deflector with Root Wad**	**1**	**EA**	**$1,674.82**	
	Riprap	20	CY	$27.16	allow 20cy
	Orientation Log	4	EA	$108.64	
	Installation	1	LS	$544.80	assume 1 hour
	Misc Work	1	LS	$152.26	stream diversion, eros/sed control, etc
CD-3	**Current Deflector-Riprap Groynes & Orientation Effect**	**1**	**EA**	**$1,915.59**	
	Riprap	20	CY	$27.16	allow 20cy
	Log	1	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$174.14	stream diversion, eros/sed control, etc
CD-4	**Current Deflector-Log Weir & Dam Structure**	**1**	**EA**	**$2,806.17**	
	Riprap	10	CY	$27.16	allow 10cy
	Streambed Gravel	10	CY	$33.95	allow 10cy
	Logs, Posts & Braces	1	LS	$271.60	
	Filter Cloth	1	LS	$33.95	
	Installation	1	LS	$1,634.41	assume 3 hours
	Misc Work	1	LS	$255.11	stream diversion, eros/sed control, etc
CD-5	**Current Deflector-Angled Vortex Rock Weir w/Rootwads**	**1**	**EA**	**$1,915.59**	
	Riprap	20	CY	$27.16	allow 10cy
	Rootwad & Anchor	1	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$174.14	stream diversion, eros/sed control, etc
CD-6	**Current Deflector-Riprap Turning Rock Wall**	**1**	**EA**	**$2,093.09**	
	Riprap	50	CY	$27.16	allow 50cy
	Installation	1	LS	$544.80	assume 1 hour
	Misc Work	1	LS	$190.28	stream diversion, eros/sed control, etc
CD-7	**Current Deflector-Riprap Tieback**	**1**	**EA**	**$2,035.10**	
	Riprap	20	CY	$27.16	allow 20cy
	Log	2	EA	$108.64	
	Installation	1	LS	$1,089.61	assume 2 hours
	Misc Work	1	LS	$185.01	stream diversion, eros/sed control, etc
CD-AVG	**Current Deflector Average Cost**	**1**	**EA**	**$2,063.65**	average cost from above
CD-SED	**Current Deflector Sediment Trap**	**1**	**EA**	**$1,870.00**	from 2007 URS Cost Update Memo
VBS-1	**Brush Mattress w/Rock Toe**	**1**	**LF**	**$52.05**	
	Rock Toe	0.5	CY	$38.06	excavate & place
	Wire or Jute Rope & Stakes	10	SF	$1.36	
	Topsoil	0.2	CY	$16.66	6"th

TABLE D-5

Detailed Unit Cost Estimate for Stream and Riparian Improvement TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Fascines	1	LS	$6.79	allowance
	Installation	1	LF	$4.59	assume 500'/day
	Misc Work	1	LS	$4.73	stream diversion, eros/sed control, etc
VBS-2	**Brush Layer**	**1**	**LF**	**$27.69**	
	Wire or Jute Rope & Stakes	10	SF	$1.36	
	Topsoil	0.1	CY	$16.66	
	Fascines	1	LS	$6.79	allowance
	Installation	1	LF	$4.59	assume 500'/day
	Misc Work	1	LS	$1.07	eros/sed control, etc
VBS-3	**Live Stake, Live Post & Joint Planted Fascines**	**1**	**LF**	**$76.25**	
	Riprap	1	CY	$27.16	
	Joint Planted Fascine	2	EA	$2.72	
	Live Stake	5	EA	$1.36	6"th
	Live Post	3	EA	$2.72	
	Installation	1	LS	$21.79	assume 200'/day
	Misc Work	1	LS	$6.93	stream diversion, eros/sed control, etc
VBS-AVG	**Vegetative Bank Stabilization - Average Cost**	**1**	**LF**	**$52.00**	average cost from above
BSBR-1	**Vegetated Geogrid**	**1**	**LF**	**$112.24**	
	Soil Excavation	2	CY	$5.45	assume 2cy/LF
	Waste	2	CY	$2.72	dispose on tailings pile
	Filter Layer	0.09	CY	$1.36	assume 5' x 6"th
	Rock Blanket	0.44	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Topsoil	1.11	CY	$16.66	assume 6' x 5'th
	Coir Geotextile	3	SY	$1.36	assume 3sy/LF
	Live Branches	5	EA	$0.68	
	Live Stakes	5	EA	$1.36	
	Straw Matting	2	SY	$2.04	assume 2sy/LF
	Installation	1	LS	$28.87	assume 150'/day
	Misc Work	1	LS	$10.20	stream diversion, eros/sed control, etc
BSBR-2	**Live Cribwall**	**1**	**LF**	**$206.54**	
	Soil Excavation	2	CY	$5.45	assume 2cy/LF
	Waste	2	CY	$2.72	dispose on tailings pile
	Timbers	36	BF	$1.36	assume 6x6 timbers & 36BF/LF
	Rock Fill	0.44	CY	$26.32	quote for Bunker Hill projects
	Topsoil	1.11	CY	$16.66	assume 6' x 5'th
	Anchor	0.01	EA	$67.90	assume 100'oc allow cost
	Live Branches	5	EA	$0.68	
	Drain Rock	1	CY	$44.67	quote for Bunker Hill projects, 20cy/hour
	Installation	1	LS	$43.58	assume 100'/day
	Misc Work	1	LS	$18.78	stream diversion, eros/sed control, etc
BSBR-3	**Low Energy Tree Revetment**	**1**	**LF**	**$61.35**	
	Soil Excavation	1	CY	$5.45	assume 1cy/LF

TABLE D-5

Detailed Unit Cost Estimate for Stream and Riparian Improvement TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Logs	0.20	EA	$108.64	assume 5' spacing, allow cost
	Revegetate Bank	1.00	SY	$1.36	1sy/LF
	Installation	1	LS	$21.79	assume 200'/day
	Misc Work	1	LS	$5.58	stream diversion, eros/sed control, etc
BSBR-4	**Moderate Energy Tree Revetment**	**1**	**LF**	**$104.27**	
	Soil Excavation	2	CY	$5.45	assume 1cy/LF
	Waste	1	CY	$2.72	dispose on tailings pile
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Logs	0.20	EA	$108.64	assume 10' spacing, allow cost for footer, header & rootwad
	5-man Rock	0.07	EA	$135.80	assume 15' spacing, allow cost
	Deadman	0.01	EA	$67.90	assume 100' spacing, allow cost
	Live Stakes & Posts	10.00	EA	$1.36	assume 10/LF
	Revegetate Bank	1.00	SY	$1.36	1sy/LF
	Installation	1	LS	$28.87	assume 150'/day
	Misc Work	1	LS	$9.48	stream diversion, eros/sed control, etc
BSBR-5	**Tree Deflector**	**1**	**LF**	**$90.48**	
	Soil Excavation	1	CY	$5.45	assume 1cy/LF
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Trees	0.10	EA	$108.64	assume 10' spacing, allow cost
	Connector Cable	1.00	LF	$2.72	
	Deadman & Cable	0.03	EA	$67.90	assume 40' spacing, allow cost
	Rock Anchor & Leash	0.10	EA	$203.70	assume 10' spacing, allow cost
	Live Stakes & Posts	10.00	EA	$1.36	assume 10/LF
	Installation	1	LS	$21.79	assume 200'/day
	Misc Work	1	LS	$8.23	stream diversion, eros/sed control, etc
BSBR-6	**Woody Debris & Vegetated Geogrid System**	**1**	**LF**	**$156.70**	
	Soil Excavation	1	CY	$5.45	assume 2cy/LF
	Backfill	1	CY	$5.45	assume excavated material backfill & compact around logs
	Logs	0.10	EA	$108.64	assume 10' spacing, allow cost
	Rock Filter Layer	0.09	CY	$21.73	assume 5' x 6"th
	Riprap	1.00	CY	$27.16	assume 1cy/LF
	Rock Anchor & Leash	0.10	EA	$203.70	assume 10' spacing, allow cost
	5-man Rock	0.07	EA	$135.80	assume 15' spacing, allow cost
	Topsoil	1.11	CY	$16.66	assume 6' x 5'th
	Coir Geotextile	3	SY	$1.36	assume 3sy/LF
	Live Branches	5	EA	$0.68	

TABLE D-5

Detailed Unit Cost Estimate for Stream and Riparian Improvement TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Live Stakes & Posts	5	EA	$1.36	
	Installation Cost	1	LS	$28.87	assume 150'/day
	Misc Work	1	LS	$14.25	stream diversion, eros/sed control, etc
BSBR-Avg	**Bioengineered Revetments-Average Cost**	**1**	**LF**	**$121.93**	average cost from above
FP/RP-1a	**Floodplain/Riparian Planting**	**1**	**SF**	**$0.54**	bank width/LF of river variable
	Site Prep	0.01	CY	$2.72	assume 4" deep average grading
	Soil Ammendments	0.01	CY	$1.73	
	Live Planting	0.1	EA	$1.36	assume 1cy/LF
	Tree Planting	0.1	EA	$2.72	allow cost
	Hydroseeding	0.1	SY	$0.41	Bunker Hill estimates
	Misc Work	1	LS	$0.05	stream diversion, eros/sed control, etc
FP/RP-1b	**Floodplain Planting**	**1**	**SF**	**$2.14**	
	Soil Excavation	0.01	CY	$5.45	assume trenches 5' apart & 10'long each side, 1cy/LF
	Backfill	0.01	CY	$5.45	assume excavated material backfill & compact around logs
	Riprap	0.01	CY	$54.40	assume 1cy/LF
	Live Branches	2	EA	$0.70	allow cost
	Installation Cost	0.01	LS	$9.19	assume 500'/day
	Misc Work	0.01	LS	$0.21	stream diversion, eros/sed control, etc
FP/RP-Avg	**Floodplain/Riparian Planting-Average Cost**	**1**	**SF**	**$1.34**	
OFFCH-1	**Groundwater-Fed Side Channel**	**6,050**	**SY**	**$23.76**	assume 1/2 hectare as typical size = approx 1.25 acre
	Cut & Fill	2,017	CY	$5.45	assume 1' deep over entire area
	Stream Gravel	2,017	CY	$39.40	assume 1' deep
	Riprap	100	CY	$54.40	allow quantity
	LWD etc	50	EA	$135.80	assume 2' spacing, allow cost
	Misc Work	1	LS	$41,067.86	stream diversion, eros/sed control, etc
OFFCH2-3	**Surface-Fed Side Channel**	**167**	**SY**	**$41.64**	assume 15'w, sloped 3h:1v, 5'd
	Cut & Fill	56	CY	$5.45	assume 1' deep over entire area
	Stream Gravel	56	CY	$39.40	assume 1' deep
	Riprap	20	CY	$54.40	assume quantity
	LWD etc	10	EA	$135.80	assume quantity
	Misc Work	1	LS	$1,982.95	stream diversion, eros/sed control, etc
OFFCH-3	**Off-Channel Pond**	**556**	**SY**	**$62.56**	assume 50'w, sloped 3h:1v, 5'd
	Soil Excavation	1,204	CY	$5.45	assume 5' deep & slope allowance
	Waste	1,204	CY	$6.86	
	Stream Gravel	185	CY	$39.40	assume 1' deep
	LWD etc	20	EA	$135.80	assume quantity
	Misc Work	1	LS	$9,930.88	
OFFCH-Avg	**Off-Channel Hydrologic Feature-Average Cost**	**2,257**	**SY**	**$42.65**	
CH REAL-1	**Channel Realignment**	**100**	**SY**	**$42.19**	
	Soil Excavation	133	CY	$5.45	assume 3' deep including slope allowance
	Waste	133	CY	$6.86	

TABLE D-5

Detailed Unit Cost Estimate for Stream and Riparian Improvement TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Quantity	Unit	2009 Direct Capital Unit Cost	Comments
	Stream Gravel	44	CY	$39.40	assume 1' deep
	Misc Work	1	LS	$843.75	bank stabilization & restoration

Notes:

BF = board foot
CY = cubic yards
EA = each
LF = linear feet
LS = lump sum
SF = square foot
SY = square yards
TCD = typical conceptual design

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-6

Summary of Cost Assumptions and Limitations for Source Control TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

TCD Code	Description	Assumptions/Limitations	
		2009 Direct Capital Unit Cost	O&M Costs
C01	Excavation	Assumes excavator (trackhoe), excavation above water table. Does not include hauling and dewatering, if needed.	Assumes complete removal.
C01b	Sediment Excavation	Assumes 60% excavation above water table, 40% below water table, with replacement of 25% of excavated sediment with imported backfill.	Assumes complete removal.
C02a	Regrade/Consolidate/Revegetate	Waste pile on hillside. Assumes average regrading depth of 5 ft.	Repair of damaged cap components potentially largest O&M element: assumed 5% of cap area repaired at year 2, 2.5% at year 5, and 1% every 5 years thereafter. O&M would also include inspections and monitoring.
C02b	Regrade/Consolidate/Revegetate	Waste pile in drainage. Assumes average regrading depth of 13 ft.	
C02c	Regrade/Consolidate/Revegetate	For slopes steeper than 1.5H:1V. Riprap used for erosion protection below nominal 100-year flood elevation.	
C03	Low Permeability Soil Cap	Uses GCL for low permeability layer. Low-permeability native soil or native soil amended with bentonite are other options.	
C04	Low Permeability Cap w/ Seepage Collection	Same as C03, with groundwater collection and diversion trench.	
C05	Low Permeability Cap with Erosion Protection	Same as C03, with addition of riprap toe.	
C06	Waste Consolidation Area with Erosion Protection	Assumes 25 ft waste thickness. Assumes GCL and 1 acre cap.	
C07	Waste Consolidation Area Above Flood Level	Cost does include a 1/2 mile haul. Assumes 25 ft waste thickness. Assumes GCL and 1 acre cap.	
C08a	Repository, 1 million cy	Cost does not include hauling. Assumes bottom liner and leachate collection system. Land acquisition costs are not included.	Includes two 16 hr inspections/year (1 spring and 1 winter) and two storm event inspections/year; Assumes 2% of capital cost for annual repairs and maintenance; Quarterly sampling and analysis
C09	Impoundment Closure	Includes regrading to 3H:1V sideslope and placement of GCL cap.	Repair of damaged cap components potentially largest O&M element: assumed 5% of cap area repaired at year 2, 2.5% at year 5, and 1% every 5 years thereafter. O&M would also include inspections and monitoring.
HAUL-2	Haul to Repository	Cost is in units of CY-MI.	No O&M costs.

Notes:

CY = cubic yards
GCL = geosynthetic clay liner
O&M = operation and maintenance
TCD = typical conceptual design

TABLE D-7

Summary of Cost Assumptions and Limitations for Water Collection, Conveyance, and Management TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
C10	Adit Drainage Collection	Costs for water treatment not included. Does not incorporate full adit seal, infiltration control, or management of water levels inside mine.	Inspections and sediment removal.
C11a	Slurry Wall (no drain) - 15 feet deep	Used for hydraulic isolation of stream reaches or discrete facilities. When used for stream reaches, cost is per linear foot of stream, one side of stream. Assumes excavated with excavator (track hoe). Assumed no excavated material reusable as backfill.	No O&M costs.
C11b	Slurry Wall (no drain) - 20 feet deep		
C11c	Slurry Wall (no drain) - 30 feet deep		
C11d	Slurry Wall (no drain) - 40 feet deep		
C11e	Slurry Wall (no drain) - 45 feet deep		
C11f	Slurry Wall (no drain) - 50 feet deep		
C11g	Slurry Wall (no drain, soil cement) - 50 feet deep		
C11h	Slurry Wall (with drain) - 15 feet deep		Inspections and drain cleanout.
C11i	Slurry Wall (with drain) - 20 feet deep		
C11j	Slurry Wall (with drain) - 30 feet deep		
C14a	Stream Lining - 10 feet wide	Assumes average bottom width of channel over entire length of application.	Routine inspection and maintenance.
C14b	Stream Lining - 20 feet wide		
C14c	Stream Lining - 100 feet wide		
C15a	French Drain - 10 feet deep	Water treatment not included in drain cost.	Inspections and drain cleanout.
C15b	French Drain - 15 feet deep		
C15c	French Drain - 20 feet deep		
C15d	French Drain - 25 feet deep		
C17a	Extraction Well - 20 feet deep (6" wide)	Costs do not include effluent piping.	Inspection, maintenance. Replacement of pumps.
C17b	Extraction Well - 40 feet deep (6" wide)		
C17c	Extraction Well - 50 feet deep (6" wide)		
C17d	Extraction Well - 50 feet deep (10" wide)		
C17e	Extraction Well - 70 feet deep (10" wide)		
C18	SFCDR Diversion	Includes coffer dam on both sides of cutoff wall.	No O&M costs.
C19	I-90 Crossing	Assumes 130' cutoff wall beneath 1-90.	No O&M costs.
C20	Check Dam	Dam height and material dependent upon water flowrate and chemistry.	No O&M costs.
PIPE-1	Gravity Pipeline - 6"	All pipelines trenched and buried. No unusual geographic, soils, or groundwater conditions. Land acquisition costs not included.	Assumed 2% replacement every 5 years.
PIPE-2	Gravity Pipeline - 12"		
PIPE-3	Gravity Pipeline - 24"		
PIPE-4	Gravity Pipeline - 36"		
PRESSURE-PIPE-1	Pressurized Pipeline - < 6" diameter	All pipelines trenched and buried. No unusual geographic, soils, or groundwater conditions. Land acquisition costs not included.	Assumed 2% replacement every 5 years.
PRESSURE-PIPE-2	Pressurized Pipeline - < 6"-14" diameter		
PRESSURE-PIPE-3	Pressurized Pipeline - >14" diameter		
PRESSURE-PIPE-4	Vertical Pipeline - 3" diameter		
PUMP-1	Pump Station - 0.14 MGD	Costs developed using CPES assuming maximum flow.	Inspection, maintenance. Replacement of pumps.
PUMP-2	Pump Station - 1.4 MGD		
PUMP-3	Pump Station - 3.9 MGD		
PUMP-4	Pump Station - 6.3 MGD		
PUMP-5	Pump Station - 6.5 MGD		

Notes:

MGD = million gallons per day

O&M = operation and maintenance

TCD = typical conceptual design

TABLE D-8

Summary of Cost Assumptions and Limitations for Water Treatment TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
WT02	Semi-Passive Lime Treatment	Includes a Lime feed system, conveyance channel, 2 settling ponds with bypass functionality, and an effluent and emergency channel	Includes cleaning of ponds (with a 50% liner replacement) at years 10 and 20. Includes lime replacement based on usage determined by design criteria. Includes monitoring 4 times/year Includes miscellaneous O&M at 8% of direct capital cost
WT03	Passive SRB Treatment	Includes 2 SRB ponds, a passive aeration channel, an aerobic polishing pond, a wetland, and an effluent and emergency channel	Includes media replacement every 15 years Includes monitoring 4 times/year Includes miscellaneous O&M at 4% of direct capital cost
WT04a	SR-PRB Treatment (10' deep, 7.5' wide, 100' long)	Includes a 10 ft. deep PRB with 5 feet excavation on top of that. Therefore the total excavation is 15 ft bgs.	Includes media replacement every 15 years Includes monitoring 4 times/year Includes miscellaneous O&M at a lump sum of $3500/year
WT04b	SR-PRB Treatment (40' deep, 7.5' wide, 100' long)	Includes a 40 ft. deep PRB with 5 feet excavation on top of that. Therefore the total excavation is 45 ft bgs.	Includes media replacement every 15 years Includes monitoring 4 times/year Includes miscellaneous O&M at a lump sum of $10,000/year

Notes:

O&M = operation and maintenance
SRB = sulfate reducing bioreactor
PRB = permeable reactive barrier
TCD = typical conceptual design

TABLE D-9

Summary of Cost Assumptions and Limitations for Human Health TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
HH-2	Upland Waste Pile Soil Cover	Assumed depth of regrading = 5 ft.	Routine inspection and maintenance.
HH-3	Millsite Decontamination	Removal and offsite disposal of hazardous substances, decontamination of building surfaces.	Routine inspection and maintenance.
HH-4	Millsite Demolition/Disposal	Assume 25% of material to hazardous waste landfill; 75% to solid waste landfill or disposed of onsite.	Routine inspection and maintenance.

Notes:

O&M = operation and maintenance

TCD = typical conceptual design

TABLE D-10

Summary of Cost Assumptions and Limitations for Stream and Riparian Improvement TCDs

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Assumptions/Limitations	
TCD Code	**Description**	**2009 Direct Capital Unit Cost**	**O&M Costs**
CD-AVG	Current Deflector Average Cost	Placement requires use of heavy machinery, riprap toe protection. Site access may also be a significant cost consideration in some cases. However, most streams in the project are paralleled by roads on one or both sides, minimizing access difficulties.	Assumes periodic (annual) inspection for evidence of outflanking or undermining. Repair or redesign and replacement may be required if damaged by high flow events or channel migration.
CD-SED	Current Deflector Sediment Trap	Detailed cost breakdown unavailable.	
VBS-AVG	Vegetative Bank Stabilization - Average Cost	Site preparation with heavy machinery and toe protection with riprap, live facines, or other material required. Banks may be stabilized with live cuttings or rooted stock, rooted stock being generally more expensive.	All plantings are vulnerable to high stream flows and desiccation until roots are established. Frequent monitoring may be required initially until the root mass is established, followed by seasonal and then annual monitoring. Protection from browsing animals, irrigation, and some replanting may be required.
BSBR-AVG	Bioengineered Revetments - Average Cost	Assumes site preparation and toe protection with heavy machinery. Placement of rocks, crib, logs, and other large heavy materials also require heavy machinery.	Requires annual monitoring for evidence of undermining or outflanking at head. Repair or additional reinforcement may be required to prevent structure failure. Occasional repair or redesign and replacement of some areas may be required if large scale failure occurs.
FP/RP-AVG	Floodplain/Riparian Planting - Average Cost	Assumes areas subject to regular overbank flows during high flow events require use of heavy machinery to create trenches for protection of live plantings. Areas less subject to overbank flow will not require heavy machinery and may follow the "dig and drop" approach to planting.	Live plantings are vulnerable to desiccation, overbank flows, and browsing animals. Protection from browsing animals and irrigation may be required initially. Assumes regular monitoring will be conducted until root mass is established, and seasonal monitoring thereafter, with site preparation and replanting conducted as required.
OFFCH-AVG	Off-Channel Hydrologic Feature-Average Cost	Off-channel hydrologic features will be sited in areas where excavation of contaminants is planned. Unit cost estimates do not include site excavation requirements assumed to be represented by the costs of contaminant removal, but do include "cut and fill" costs using heavy machinery for additional site preparation as needed.	O&M rates for off-channel hydrologic features can vary considerably. Properly constructed groundwater fed features will require minimal maintenance, whereas surface water fed features may require an active O&M plan to maintain connectivity to the mainstem, hydrologic performance, and ensuring fish access and other habitat considerations as desired. Accordingly, monitoring requirements will vary with the type of feature.
CH REAL-1	Channel Realignment	Channel realignment may be required as part of an integrated approach to streambank and substrate stabilization. This approach assumes use of heavy machinery and possibly temporary flow diversion.	Assuming proper design and implementation, channel realignment is directed towards creating a self-maintaining structural change requiring minimal O&M. However, realignment failure and subsequent channel migration can result in failure of bank stabilization and other remedial measures, requiring extensive replacement

Notes:

O&M = operation and maintenance

TCD = typical conceptual design

TABLE D-11

Alternative RP-1 - Pinehurst Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$11,127,000			
			2.00%	$8,958,000	$179,200
25	4.00%	$6,788,000			
			16.00%	$5,166,000	$826,600
5	20.00%	$3,544,000			
Total					**$1,005,800**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$12,480,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-12

Alternative RP-1: Smelterville Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$6,468,000			
			2.00%	$4,887,000	$97,700
25	4.00%	$3,306,000			
			16.00%	$2,071,000	$331,400
5	20.00%	$835,000			
Total					**$429,100**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$5,320,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-13

Alternative RP-1: Kellogg Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$867,000			
			2.00%	$806,000	$16,100
25	4.00%	$745,000			
			16.00%	$610,000	$97,600
5	20.00%	$474,000			
Total					**$113,700**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$1,410,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-14

Alternative RP-1: Wardner Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$696,000			
			2.00%	$696,000	$13,900
25	4.00%	$696,000			
			16.00%	$696,000	$111,400
5	20.00%	$696,000			
Total					**$125,300**

Real Discount Rate	7%
Target Number of Years for Remedy Protection	30
Present Value of Expected Annual Damage Over 30-year period	**$1,550,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-15

Alternative RP-1: Osburn Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$4,440,000			
			2.00%	$4,032,000	$80,600
25	4.00%	$3,623,000			
			16.00%	$2,473,000	$395,700
5	20.00%	$1,322,000			
Total					**$476,300**

Real Discount Rate	7%
Target Number of Years for Remedy Protection	30
Present Value of Expected Annual Damage Over 30-year period	**$5,910,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-16

Alternative RP-1: Silverton Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$3,192,000			
			2.00%	$2,401,000	$48,000
25	4.00%	$1,610,000			
			16.00%	$1,282,000	$205,100
5	20.00%	$954,000			
Total					**$253,100**

Real Discount Rate	7%
Target Number of Years for Remedy Protection	30
Present Value of Expected Annual Damage Over 30-year period	**$3,140,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-17

Alternative RP-1: Wallace Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$534,000			
			2.00%	$392,000	$7,800
25	4.00%	$249,000			
			16.00%	$169,000	$27,000
5	20.00%	$88,000			
Total					**$34,800**
Real Discount Rate					7%
Target Number of Years for Remedy Protection					30
Present Value of Expected Annual Damage Over 30-year period					**$430,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-18

Alternative RP-1: Mullan Cost Analysis

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Calculation of Expected Annual Damage [1]

30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence	Estimated Damage[2]	Frequency Interval	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$2,889,000			
			2.00%	$2,477,000	$49,500
25	4.00%	$2,065,000			
			16.00%	$1,457,000	$233,100
5	20.00%	$848,000			
Total					**$282,600**

Real Discount Rate	7%
Target Number of Years for Remedy Protection	30
Present Value of Expected Annual Damage Over 30-year period	**$3,510,000**

Notes:

[1] Calculation of expected annual damage based on method described in Memorandum: *Methodology for Estimating Expected Loss from Damage to Remedies* (CH2M HILL, September 16, 2009).

[2] Estimated damage values are from Appendix G in this Focused Feasibility Study Report. Based on modeling results and remediation costs of $5.17 per square foot.

TABLE D-19

Alternative RP-1: Approximate Cost for Side Gulches

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Total Area of Existing Selected Remedies in Side Gulches[1]		11,320,000	SF
Unit Cost to Re-remediate (or Repair) Selected Remedies[2]	$	5.17	per SF

Estimated Area of Remedy at Risk for 5-, 25-, and 50-year Storm Events

Storm Event (Years)	Estimated Percent of Remedy at Risk[3] (%)	Estimated Area of Remedy at Risk[4] (SF)	Estimated Cost to Re-Remediate[5] ($)
50	25%	2,830,000	$ 14,600,000
25	16%	1,810,000	$ 9,400,000
5	7%	790,000	$ 4,080,000

Calculation of Expected Annual Damage[6]
30-Year Life Cycle Cost

Storm Event (Years)	Probability of Occurrence[7]	Estimated Damage[8]	Frequency Interval[9]	Average Damage for Frequency Interval	Expected Annual Damage
50	2.00%	$ 14,600,000			
			2.00%	$12,000,000	$240,000
25	4.00%	$ 9,400,000			
			16.00%	$6,700,000	$1,070,000
5	20.00%	$ 4,080,000			
				Total	**$1,310,000**

Real Discount Rate	7%
Target Number of Years for Remedy Protection	30
Present Value of Expected Annual Damage Over 30-year period	**$16,300,000**

TOTAL APPROXIMATE COST (30-year NPV) for Side Gulches	**$16,300,000**

Notes:

SF = square feet

NPV = net present value

[1] Total area of existing Selected Remedies in side gulches calculated by GIS analysis as documented in TerraGraphics Technical Memorandum (CITE) .

[2] This cost was developed by TerraGraphics and is documented in Appendix G of the FFS Report.

[3] The estimated percent of remedy at risk is based on the average remedy at risk for the eight communities where hydrologic and hydraulic modeling analyses were conducted. This is documented in Table 9-3 in the FFS Report.

[4] The estimated area of remedy at risk multiplies the estimated percent of remedy at risk by the total existing remedy in the side gulches.

[5] The estimated cost to re-remediate multiplies the estimated area of remedy at risk by the unit costs to re-remediate (or repair) Selected Remedies

[6] Calculation of expected annual damage based on method described in*Methodology for Estimating Expected Loss from Damage to Remedies Memorandum* (CH2M HILL, 2009k).

[7] Probability of occurrence calculated based on the percent chance that the storm event will happen in any given year For example in a single year, there is a 2% probability of experiencing the damage from a 50-year storm event.

[8] Estimated damage values are from modeling outputs and unit cost assumptions discussed in Section 9.6.1.1 and documented in Appendix G of the FFS Report.

[9] The frequency interval is the difference between the probability of occurrence for two storm events.

TABLE D-20

Alternative RP-2: Pinehurst Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Little Pine Creek						
1	Channel Modification-Increase Left Bank Height To 4 ft With A 1 ft Tall Berm (XS 1)	165	LF	$110	$18,150	$30,855
2	Reconstruct Existing Earthen Channel To 10' X 3' Channel W/ 3' Vert Concrete Wall Along Left Side Of Channel (XS 2)	80	LF	$340	$27,200	$46,240
3	Reconstruct Existing Earthen Channel To 12' X 3' (L) X 6' (R) Concrete Channel (XS 3A)	50	LF	$928	$46,400	$78,880
4	Reconstruct Existing Earthen Channel To 12' X 3' (L) X 6' (R) Concrete Channel (XS 3B)	100	LF	$933	$93,300	$158,610
5	Reconstruct Existing Earthen Channel To 12' X 3.5' (L) X 4' (R) Concrete Channel (XS 4)	125	LF	$780	$97,500	$165,750
6	Reconstruct Existing Earthen Channel To 12' X 3' (L) Concrete Channel (XS 6A)	105	LF	$697	$73,185	$124,415
7	Reconstruct Existing Earthen Channel To 12' X 3' (L) Concrete Channel (XS 6B)	105	LF	$697	$73,185	$124,415
8	Reconstruct Existing Earthen Channel To 12' X 3' (L) Concrete Channel (XS 6C)	180	LF	$711	$127,980	$217,566
9	Channel Modification-Increase Left Bank Height To 3 ft With A 1.4 ft Tall Berm (XS 10)	330	LF	$37	$12,210	$20,757
10	Reconstruct Existing Channel By Widening To 28'X18'X2.5' Earthen Channel W/ 0.8 ft Tall Berm On Right And Left Bank (XS 11)	270	LF	$56	$15,120	$25,704
11	Channel Modifications-Construct 0.5 ft Tall Berm On Left Bank And Increase Channel Bottom By 0.1 ft To Account For Slope Alterations (XS 13)	170	LF	$22	$3,740	$6,358
12	Channel Modifications-Construct 0.5 ft Tall Berm On Left Bank And Decrease Channel Bottom By 0.5 ft To Account For Slope Alterations (XS 14)	120	LF	$28	$3,360	$5,712
13	Channel Modifications-Decrease Channel Depth By 0.7 ft To Account For Slope Alterations (XS 15)	55	LF	$28	$1,540	$2,618
14	Reconstruct Existing Channel To 25.2'X11'X3.1' (L) X 4' (R) Earthen Channel And Decrease Channel Depth By 0.7 ft To Account For Slope Alterations (XS 16)	55	LF	$65	$3,575	$6,078
15	Replace Existing Wood Driveway Bridge With 14'X26' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 1, Xs 5)	1	EA	$169,000	$169,000	$287,300
16	Replace Existing Steel Driveway Bridge With 14'X15' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 2, Xs 7)	1	EA	$103,000	$103,000	$175,100
17	Replace Existing Wood Driveway Bridge With 14'X18' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 3, Xs 8)	1	EA	$118,000	$118,000	$200,600
18	Replace Existing Driveway Bridge With 14'X16' Single Span Bridge W/ A Clear Height Of 2.5 ft (Bridge 4, Xs 9)	1	EA	$110,000	$110,000	$187,000
19	Replace Existing Concrete Box Culvert (3'X8'X28') With 18'X28' Single Span Bridge W/ A Clear Height Of 3 ft (Bridge 5, Xs 12)	1	EA	$224,000	$224,000	$380,800
20	Replace Existing Wood Bridge (12'X4') With 14'X4' Single Span Bridge W/ A Clear Height Of 3.6 ft (Bridge 6)	1	EA	$34,000	$34,000	$57,800
					Subtotal Rounded	**$2,300,000**
	NPV for 30-year O&M Cost					**$844,000**
	Total NPV cost at 30 years					**$3,144,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Little Pine Creek						
1	**INCREASE LEFT BANK HEIGHT TO 4 FT W/ 1 FT BERM (1)**	**165**	**LF**			see detail
	Prep Channel Bank	165	LF	$86.03	$14,194	difficult operation, assume 10 dys
	Imported Fill Material	34.8	CY	$62.91	$2,191	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$1,639	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$29**	
	Total Direct Unit Cost			**$110.00**	**$18,053**	
2	**RECONSTRUCT EXISTING CHANNEL TO 10' W/ 3' WALL (2)**	**80**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$479	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	26.7	CY	$14.80	$395	
	Prep & Grade Channel	80	LF	$7.84	$627	
	Haul & Dispose at Repository	26.7	CY	$5.49	$146	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	26.7	CY	$11.38	$303	use C8a cost
	Imported Fill Material	17.8	CY	$53.33	$948	imported, difficult operation
	CIP Wall, 12" thk, 3' tall + 1 foot below grade	11.9	CY	$737.64	$8,742	
	Wall Rebar @ 200 #/cy	2370.4	LB	$1.79	$4,231	
	CIP Wall Footing, 2.5 wide x 1.5' tall	11.1	CY	$496.76	$5,520	
	Footing Rebar @ 150 #/cy	1666.7	LB	$1.79	$2,975	
	Misc Detail Allowance	10%	LS	$0.00	$2,392	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$375**	
	Total Direct Unit Cost			**$340.00**	**$27,134**	
3	**RECONSTRUCT CHANNEL W/ 3' L WALL, 6' R WALL, 12' CHANNEL (3A)**	**50**	**LF**			
	Clear, Grub & Dispose	0.0	AC	$6,514.75	$299	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing RR Tie and Debris	50	LF	$62.74	$3,137	
	Excavate Channel	55.6	CY	$14.80	$822	
	Prep & Grade Channel	50	LF	$7.84	$392	
	Haul & Dispose at Repository	55.6	CY	$5.49	$305	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	55.6	CY	$11.38	$632	use C8a cost
	Imported Fill Material	20.4	CY	$53.33	$1,086	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	5.6	CY	$737.64	$4,098	
	Wall Rebar @ 200 #/cy	1111.1	LB	$1.79	$1,983	
	CIP Wall, 12" thk, 6' tall	11.1	CY	$737.64	$8,196	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Wall Rebar @ 200 #/cy	2222.2	LB	$1.79	$3,967	
	CIP Slab, 12" thk, 16' wide	30	CY	$295.88	$8,767	
	Footing Rebar @ 150 #/cy	4,444	LB	$1.79	$7,934	
	Misc Detail Allowance	10%	LS	$0.00	$4,068	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$682**	
	Total Direct Unit Cost			**$928.00**	**$46,369**	
4	**RECONSTRUCT CHANNEL W/ 3' L WALL, 6' R WALL, 12' CHANNEL (3B)**	**100**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$598	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing RR Tie and Debris	100	LF	$62.74	$6,274	
	Excavate Channel	127.8	CY	$14.80	$1,891	
	Prep & Grade Channel	100	LF	$7.84	$784	
	Haul & Dispose at Repository	127.8	CY	$5.49	$702	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	127.8	CY	$11.38	$1,454	use C8a cost
	Imported Fill Material	40.7	CY	$53.33	$2,173	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	11.1	CY	$737.64	$8,196	
	Wall Rebar @ 200 #/cy	2222.2	LB	$1.79	$3,967	
	CIP Wall, 12" thk, 6' tall	22.2	CY	$737.64	$16,392	
	Wall Rebar @ 200 #/cy	4444.4	LB	$1.79	$7,934	
	CIP Slab, 12" thk, 16' wide	59	CY	$295.88	$17,534	
	Footing Rebar @ 150 #/cy	8,889	LB	$1.79	$15,868	
	Misc Detail Allowance	10%	LS	$0.00	$8,161	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,364**	
	Total Direct Unit Cost			**$933.00**	**$93,290**	
5	**RECONSTRUCT CHANNEL W/ 3.5' L WALL, 4' R WALL, 12' CHANNEL (4)**	**125**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$748	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	125.0	CY	$14.80	$1,850	
	Prep & Grade Channel	125	LF	$7.84	$980	
	Haul & Dispose at Repository	125.0	CY	$5.49	$686	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	125.0	CY	$11.38	$1,423	use C8a cost
	Imported Fill Material	34.7	CY	$53.33	$1,852	imported, difficult operation
	CIP Wall, 12" thk, 3.5' tall	16.2	CY	$737.64	$11,953	
	Wall Rebar @ 200 #/cy	3240.7	LB	$1.79	$5,785	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	CIP Wall, 12" thk, 4' tall	18.5	CY	$737.64	$13,660	
	Wall Rebar @ 200 #/cy	3703.7	LB	$1.79	$6,611	
	CIP Slab, 12" thk, 16' wide	74	CY	$295.88	$21,917	
	Footing Rebar @ 150 #/cy	11,111	LB	$1.79	$19,834	
	Misc Detail Allowance	10%	LS	$0.00	$8,519	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,565**	
	Total Direct Unit Cost			**$780.00**	**$97,383**	
6	**RECONSTRUCT CHANNEL W/ 3' L & R WALL, 12' CHANNEL (6A)**	**105**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$628	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	68.4	CY	$14.80	$1,013	
	Prep & Grade Channel	105	LF	$7.84	$823	
	Haul & Dispose at Repository	68.4	CY	$5.49	$376	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	68.4	CY	$11.38	$779	use C8a cost
	Imported Fill Material	23.3	CY	$53.33	$1,244	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	
	CIP Slab, 12" thk, 16' wide	62	CY	$295.88	$18,410	
	Footing Rebar @ 150 #/cy	9,333	LB	$1.79	$16,661	
	Misc Detail Allowance	10%	LS	$0.00	$6,432	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,204**	
	Total Direct Unit Cost			**$697.00**	**$73,113**	
7	**RECONSTRUCT CHANNEL W/ 3' L & R WALL, 12' CHANNEL (6B)**	**105**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$628	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	70.0	CY	$14.80	$1,036	
	Prep & Grade Channel	105	LF	$7.84	$823	
	Haul & Dispose at Repository	70.0	CY	$5.49	$384	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	70.0	CY	$11.38	$797	use C8a cost
	Imported Fill Material	23.3	CY	$53.33	$1,244	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	CIP Wall, 12" thk, 3' tall	11.7	CY	$737.64	$8,606	
	Wall Rebar @ 200 #/cy	2333.3	LB	$1.79	$4,165	
	CIP Slab, 12" thk, 16' wide	62	CY	$295.88	$18,410	
	Footing Rebar @ 150 #/cy	9,333	LB	$1.79	$16,661	
	Misc Detail Allowance	10%	LS	$0.00	$6,435	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,204**	
	Total Direct Unit Cost			**$697.00**	**$73,165**	
8	**RECONSTRUCT CHANNEL W/ 3' L & R WALL, 12' CHANNEL (6C)**	**180**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,077	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	53.3	CY	$14.80	$789	
	Prep & Grade Channel	180	LF	$7.84	$1,412	
	Haul & Dispose at Repository	53.3	CY	$5.49	$293	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	53.3	CY	$11.38	$607	use C8a cost
	Imported Fill Material	120.0	CY	$53.33	$6,399	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	20.0	CY	$737.64	$14,753	
	Wall Rebar @ 200 #/cy	4000.0	LB	$1.79	$7,140	
	CIP Wall, 12" thk, 3' tall	20.0	CY	$737.64	$14,753	
	Wall Rebar @ 200 #/cy	4000.0	LB	$1.79	$7,140	
	CIP Slab, 12" thk, 16' wide	107	CY	$295.88	$31,561	
	Footing Rebar @ 150 #/cy	16,000	LB	$1.79	$28,562	
	Misc Detail Allowance	10%	LS	$0.00	$11,359	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$2,130**	
	Total Direct Unit Cost			**$711.00**	**$127,974**	
9	**INCREASE L BANK TO 3' WITH 1.4 FT BERM (10)**	**330**	**LF**			
	Clear, Grub & Dispose	0.3	AC	$6,514.75	$1,974	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	58.7	CY	$14.80	$868	
	Prep & Grade Channel	330	LF	$7.84	$2,588	
	Haul & Dispose at Repository	58.7	CY	$5.49	$322	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	58.7	CY	$11.38	$668	use C8a cost
	Imported Fill Material	85.6	CY	$53.33	$4,563	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$999	access.TESC, restoration, etc

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Sales Tax on Materials	**5%**			**$71**	
	Total Direct Unit Cost			**$37.00**	**$12,052**	
10	**INCREASE CHANNEL HEIGHT TO 2.5' AND 18' WIDE, (11)**	**270**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,615	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	229.5	CY	$14.80	$3,396	
	Prep & Grade Channel	270	LF	$7.84	$2,117	
	Haul & Dispose at Repository	229.5	CY	$5.49	$1,260	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	229.5	CY	$11.38	$2,612	use C8a cost
	Imported Fill Material	52.8	CY	$53.33	$2,816	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$994	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$44**	
	Total Direct Unit Cost			**$56.00**	**$14,854**	
11	**CONSTRUCT 6" BERM ON LEFT BANK, INCREASE BOTTOM 0.1', (13)**	**170**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,017	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	0.0	CY	$14.80	$0	
	Prep & Grade Channel	170	LF	$7.84	$1,333	
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C8a cost
	Imported Fill Material	18.6	CY	$53.33	$994	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$334	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$15**	
	Total Direct Unit Cost			**$22.00**	**$3,694**	
12	**CONSTRUCT 6" BERM ON LEFT BANK, LOWER BOTTOM 0.5', (14)**	**120**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$718	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	31.1	CY	$14.80	$460	
	Prep & Grade Channel	120	LF	$7.84	$941	
	Haul & Dispose at Repository	31.1	CY	$5.49	$171	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	31.1	CY	$11.38	$354	use C8a cost

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Imported Fill Material	6.7	CY	$53.33	$356	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$247	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$6**	
	Total Direct Unit Cost			**$28.00**	**$3,253**	
13	**LOWER CHANNEL BOTTOM BY 0.7' (15)**	**55**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$329	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	20.0	CY	$14.80	$295	
	Prep & Grade Channel	55	LF	$7.84	$431	
	Haul & Dispose at Repository	20.0	CY	$5.49	$110	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	20.0	CY	$11.38	$227	use C8a cost
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$106	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$28.00**	**$1,498**	
14	**RECONSTRUCT CHANNEL: 25.2'x11'x3.1'(L)x4'®, LOWER BOTTOM 0.7'**	**55**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$329	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	81.1	CY	$14.80	$1,200	
	Prep & Grade Channel	55	LF	$7.84	$431	
	Haul & Dispose at Repository	81.1	CY	$5.49	$445	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	81.1	CY	$11.38	$923	use C8a cost
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$196	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$65.00**	**$3,525**	
15	**REPLACE EXISTING BRIDGE W/ NEW 14'x26' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 14'x26'	364	SF	$30.00	$10,920	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	2.4	CY	$737.64	$1,776	
	Wall Rebar @ 200 #/cy	481.5	LB	$1.79	$859	
	CIP Wall, 12" thk, 2.5' tall	2.4	CY	$737.64	$1,776	
	Wall Rebar @ 200 #/cy	481.5	LB	$1.79	$859	
	CIP Slab, 12" thk, 16' wide	15	CY	$295.88	$4,559	
	Footing Rebar @ 150 #/cy	2,311	LB	$1.79	$4,126	
	New Bridge & Abutments - Steel	364	SF	$300.00	$109,200	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$27,010	minor traffic control, TESC, etc
	SUBTOTAL				**$162,061**	
	Total Direct Unit Cost			**$169,000.00**	**$168,914**	
16	**REPLACE EXISTING BRIDGE W/ NEW 14'x15' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Steel Bridge, 14'x15'	210	SF	$50.00	$10,500	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	1.4	CY	$737.64	$1,025	
	Wall Rebar @ 200 #/cy	277.8	LB	$1.79	$496	
	CIP Wall, 12" thk, 2.5' tall	1.4	CY	$737.64	$1,025	
	Wall Rebar @ 200 #/cy	277.8	LB	$1.79	$496	
	CIP Slab, 12" thk, 16' wide	9	CY	$295.88	$2,630	
	Footing Rebar @ 150 #/cy	1,333	LB	$1.79	$2,380	
	New Bridge & Abutments - Steel	210	SF	$300.00	$63,000	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$16,505	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$3,954**	
	Total Direct Unit Cost			**$103,000.00**	**$102,986**	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
17	**REPLACE EXISTING BRIDGE W/ NEW 14'x18' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 14'x18'	252	SF	$30.00	$7,560	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	1.7	CY	$737.64	$1,229	
	Wall Rebar @ 200 #/cy	333.3	LB	$1.79	$595	
	CIP Wall, 12" thk, 2.5' tall	1.7	CY	$737.64	$1,229	
	Wall Rebar @ 200 #/cy	333.3	LB	$1.79	$595	
	CIP Slab, 12" thk, 16' wide	11	CY	$295.88	$3,156	
	Footing Rebar @ 150 #/cy	1,600	LB	$1.79	$2,856	
	New Bridge & Abutments - Steel	252	SF	$300.00	$75,600	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$18,759	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$4,744**	
	Total Direct Unit Cost			**$118,000.00**	**$117,301**	
18	**REPLACE EXISTING BRIDGE W/ NEW 14'x16' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 14'x18'	224	SF	$50.00	$11,200	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall	1.5	CY	$737.64	$1,093	
	Wall Rebar @ 200 #/cy	296.3	LB	$1.79	$529	
	CIP Wall, 12" thk, 2.5' tall	1.5	CY	$737.64	$1,093	
	Wall Rebar @ 200 #/cy	296.3	LB	$1.79	$529	
	CIP Slab, 12" thk, 16' wide	9	CY	$295.88	$2,805	
	Footing Rebar @ 150 #/cy	1,422	LB	$1.79	$2,539	
	New Bridge & Abutments - Steel	224	SF	$300.00	$67,200	based on road & bridge file

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Misc Detail Allowance	20%	LS	$0.00	$17,593	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$4,217**	
	Total Direct Unit Cost			**$110,000.00**	**$109,773**	
19	**REPLACE EXISTING CULVERT W/ NEW 18'x28' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Exist Culvert, 8'x28'	224	SF	$50.00	$11,200	
	Excavate Trench	8.3	CY	$7.84	$65	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	20.7	CY	$9.94	$206	assume all wasted to repository
	Haul & Dispose at Repository	8.3	CY	$5.49	$46	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	8.3	CY	$11.38	$94	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 3.0' tall +1 bury	4.1	CY	$737.64	$3,060	
	Wall Rebar @ 200 #/cy	829.6	LB	$1.79	$1,481	
	CIP Wall, 12" thk, 3.0' tall +1 bury	4.1	CY	$737.64	$3,060	
	Wall Rebar @ 200 #/cy	829.6	LB	$1.79	$1,481	
	CIP Wall Footing, 2.5 wide x 1.5' tall	7.8	CY	$496.76	$3,864	
	Footing Rebar @ 150 #/cy	1166.7	LB	$1.79	$2,083	
	New Bridge & Abutments - Steel	504	SF	$300.00	$151,200	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$35,735	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$9,347**	
	Total Direct Unit Cost			**$224,000.00**	**$223,897**	
20	**REPLACE EXISTING BRIDGE W/ NEW 14'x4' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	77.8	SY	$12.55	$976	
	Remove & Dispose Existing Wooden Bridge, 12'x14'	48	SF	$50.00	$2,400	
	Excavate Trench	0.0	CY	$7.84	$0	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 3.6' tall	1.9	CY	$737.64	$1,377	
	Wall Rebar @ 200 #/cy	373.3	LB	$1.79	$666	

TABLE D-21

Alternative RP-2: Pinehurst Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
CIP Wall, 12" thk, 3.6' tall	1.9	CY	$737.64	$1,377	
Wall Rebar @ 200 #/cy	373.3	LB	$1.79	$666	
CIP Slab, 12" thk, 16' wide	4	CY	$295.88	$1,227	
Footing Rebar @ 150 #/cy	622	LB	$1.79	$1,111	
New Bridge & Abutments - Steel	56	SF	$300.00	$16,800	based on road & bridge file
Misc Detail Allowance	20%	LS	$0.00	$5,320	minor traffic control, TESC, etc
Sales Tax on Materials	**5%**			**$1,137**	
Total Direct Unit Cost			**$34,000.00**	**$33,058**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = [?]

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-22

Alternative RP-2: Smelterville Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Grouse Creek						
1	Abandon Existing 36" Dia Concrete Culvert (Culvert 1)	60	LF	$59	$3,540	$6,018
2	Abandon Existing 36" Dia Concrete Culvert (Culvert 2)	50	LF	$59	$2,950	$5,015
3	Install/Construct New 4.5' X 8' Concrete Box Culvert (Culvert 3)	105	LF	$1,359	$142,695	$242,582
4	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek (Xs 1)	335	LF	$433	$145,055	$246,594
5	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek (Xs 2)	620	LF	$433	$268,460	$456,382
6	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek (Xs 3)	880	LF	$420	$369,600	$628,320
7	Reconstruct Existing Channel - Install 4.5' Tall Vertical Concrete Wall Along N Side Of Creek And 0.7' Berm On S Side Of Creek (Xs 4)	160	LF	$432	$69,120	$117,504
					Subtotal Rounded	**$1,700,000**
	NPV for 30-year O&M Cost					**$620,000**
	Total NPV cost at 30 years					**$2,320,000**

Notes:

NPV = Net Present Value
LF = linear feet
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-23

Alternative RP-2: Smelterville Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Grouse Creek						
1,2	**Abandon Existing 36" Dia Concrete Culvert**	**50**	**LF**			
	Fill with CDF	13	CY	$100.00	$1,309	leave open, use as overflow storage
	Pumping Costs	13	CY	$80.82	$1,058	
	Misc Detail Allowance	20%	LS	$0.00	$473	
	Sales Tax on Materials	**5%**			**$79**	
	Total Direct Unit Cost			**$59.00**	**$2,919**	
3	**Construct New 4.5'x8" Concrete Box Culvert**	**105**	**LF**			
	Total Direct Unit Cost	180.0	SY	$12.55	$2,258	
	Excavate Channel	368.5	CY	$5.92	$2,181	25cy/hr to remove & load
	Imported Fill Material	177.4	CY	$24.94	$4,426	imported
	Haul & Dispose at Repository	368.5	CY	$5.57	$2,054	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	368.5	CY	$11.38	$4,193	use C8a cost
	CIP Wall, 8" thk, 105 lf x 4.5 ft tall	23.5	CY	$737.64	$17,298	
	Wall Rebar @ 200 #/cy	4690.0	LB	$1.79	$8,372	
	CIP Elv Slab, 8' wide x 8" Thk	41.7	CY	$664.70	$27,711	
	Elv Slab Rebar @ 200 #/cy	8337.8	LB	$1.79	$14,884	
	CIP Slab, 8' wide x 8" thk	41.7	CY	$295.88	$12,335	
	Footing Rebar @ 150 #/cy	6253.3	LB	$1.79	$11,163	
	ACP Pavement, 4" thk	41	TON	$70.00	$2,873	
	CSBC, 6" thk	30	CY	$31.26	$938	
	Flagger	200	HR	$60.14	$12,028	
	Misc Detail Allowance	15%	LS	$0.00	$17,778	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$2,167**	
	Total Direct Unit Cost			**$1,359.00**	**$142,657**	
4,5	**Reconstruct Exist Channel w/ 4.5' wall, 15' bottom, XS1&2**	**335**	**LF**			
	Clear, Grub & Dispose	0.3	AC	$6,514.75	$2,004	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	375.3	CY	$14.80	$5,554	
	Prep & Grade Channel	335	LF	$7.84	$2,627	
	Haul & Dispose at Repository	375.3	CY	$5.49	$2,061	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	375.3	CY	$11.38	$4,271	use C8a cost
	Imported Fill Material	68.2	CY	$53.33	$3,639	imported, difficult operation
	CIP Wall, 12" thk, 4.5' tall + 1 foot below grade	68.2	CY	$737.64	$50,337	
	Wall Rebar @ 200 #/cy	13648.1	LB	$1.79	$24,363	

TABLE D-23

Alternative RP-2: Smelterville Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	CIP Wall Footing, 2.5 wide x 1.5' tall	46.5	CY	$496.76	$23,113	
	Footing Rebar @ 150 #/cy	6979.2	LB	$1.79	$12,459	
	Misc Detail Allowance	10%	LS	$0.00	$12,410	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,903**	
	Total Direct Unit Cost			**$433.00**	**$144,741**	
6	**Reconstruct Exist Channel w/ 4.5' wall, 13.7' bottom, XS3**	**880**	**LF**			
	Clear, Grub & Dispose	0.8	AC	$6,514.75	$5,264	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	490.5	CY	$14.80	$7,259	
	Prep & Grade Channel	880	LF	$7.84	$6,901	
	Haul & Dispose at Repository	490.5	CY	$5.49	$2,693	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	490.5	CY	$11.38	$5,582	use C8a cost
	Imported Fill Material	268.9	CY	$53.33	$14,340	imported, difficult operation
	CIP Wall, 12" thk, 4.5' tall + 1 foot below grade	179.3	CY	$737.64	$132,229	
	Wall Rebar @ 200 #/cy	35851.9	LB	$1.79	$63,999	
	CIP Wall Footing, 2.5 wide x 1.5' tall	122.2	CY	$496.76	$60,715	
	Footing Rebar @ 150 #/cy	18333.3	LB	$1.79	$32,727	
	Misc Detail Allowance	10%	LS	$0.00	$32,343	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$5,072**	
	Total Direct Unit Cost			**$420.00**	**$369,124**	
7	**Reconstr Exist Channel w/ 4.5' wall, 10.5' bottom, & berm, XS4**	**880**	**LF**			
	Clear, Grub & Dispose	0.8	AC	$6,514.75	$5,264	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	824.6	CY	$14.80	$12,202	
	Prep & Grade Channel	880	LF	$7.84	$6,901	
	Haul & Dispose at Repository	824.6	CY	$5.49	$4,527	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	824.6	CY	$11.38	$9,384	use C8a cost
	Imported Fill Material behind wall	179.3	CY	$53.33	$9,560	imported, difficult operation
	Imported Fill Material for berm	88.0	CY	$53.33	$4,693	imported, difficult operation
	CIP Wall, 12" thk, 4.5' tall + 1 foot below grade	179.3	CY	$737.64	$132,229	
	Wall Rebar @ 200 #/cy	35851.9	LB	$1.79	$63,999	
	CIP Wall Footing, 2.5 wide x 1.5' tall	122.2	CY	$496.76	$60,715	
	Footing Rebar @ 150 #/cy	18333.3	LB	$1.79	$32,727	
	Misc Detail Allowance	10%	LS	$0.00	$32,829	access.TESC, restoration, etc

TABLE D-23

Alternative RP-2: Smelterville Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Sales Tax on Materials	**5%**			**$5,071**	
Total Direct Unit Cost			**$432.00**	**$380,101**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion sedimentation control

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-24

Alternative RP- 2: Kellogg Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Jackass Creek						
1	Reconstruct Existing Channel To 15' X 12' X 5' Channel (Xs 1)	260	LF	$34	$8,840	$15,028
2	Line Side Of Channel With Riprap (5.00 Cf/Lf)	260	LF	$25	$6,500	$11,050
3	Line Culvert Entrance With 15 Cy Of Rip Rap	2	EA	$830	$1,660	$2,822
						$0
Portland Road						$0
1	Construct 4'X0.5'X2' Rock-Lined Ditch Along South Side Of Portland Road. Must First Remove Existing Wooden 1'X1'X1' Flume	1070	LF	$50	$53,500	$90,950
2	Install 300 Lf Of 36" Dia Cpe Pipe In Place Of Existing Pipe	300	LF	$240	$72,000	$122,400
3	Remove And Replace Existing Concrete Vault With 4'X4'X4' Concrete Inlet	1	EA	$6,004	$6,004	$10,207
4	Install 2' W X 1' H X 12' L Rock Water Bars At 250 Lf Spacings Along Portland Road (4 To 5 Rock Bars Total)	1	LS	$325	$325	$553
5	Re-Grade Gravel Road (Portland Road) To Drain South Towards New Ditch	1070	LF	$13	$13,910	$23,647
					Subtotal Rounded	**$280,000**
	NPV for 30-year O&M Cost					**$149,000**
	Total NPV cost at 30 years					**$429,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-25

Alternative RP-2: Kellogg Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Jackass Creek						
1	**Reconstruct Existing Channel to 15'x12'x5' -XS1**	**260**	**LF**			
	Clear, Grub & Dispose	50.0	AC	$6,514.75	$1,555	
	Excavate Channel	145.6	CY	$14.80	$2,155	
	Prep & Grade Channel	260	LF	$7.84	$2,039	
	Haul & Dispose at Repository	145.6	CY	$5.49	$799	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	145.6	CY	$11.38	$1,657	use C8a cost
	Misc Detail Allowance	10%	LS	$0.00	$575	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$34.00**	**$8,780**	
2	**Line Side of Channel with Riprap**	**260**	**LF**			
Description	Riprap	52	CY	$72.91	$3,791	imported, difficult operation
	Prep & Grade Channel	260	LF	$7.84	$2,039	
	Misc Detail Allowance	10%	LS	$0.00	$583	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$72**	
	Total Direct Unit Cost			**$25.00**	**$6,485**	
3	**Line Culvert Entrance with Riprap**	**1**	**EA**			
	Riprap	15	CY	$48.96	$734	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$73	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$21**	
	Total Direct Unit Cost			**$830.00**	**$828**	
Portland Road						
1	**Construct 4'x0.5'x2' rock lined ditch**	**1,070**	**LF**			
	Clear, Grub & Dispose	0.7	AC	$6,514.75	$4,801	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	713.3	CY	$14.80	$10,556	
	Prep & Grade Channel	1,070	LF	$7.84	$8,391	
	Haul & Dispose at Repository	713.3	CY	$5.49	$3,916	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	713.3	CY	$11.38	$8,118	use C8a cost
	Imported Fill Material	257.6	CY	$53.33	$13,737	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$3,748	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$213**	

TABLE D-25

Alternative RP-2: Kellogg Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Total Direct Unit Cost			**$50.00**	**$53,480**	
2	**PIPELINE - 36" CHDPE, 6' TO INVERT**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.6	SY	$12.55	$20	
	Excavate Trench	1.4	CY	$3.92	$6	
	Bed & Zone	0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$20	
	Haul & Dispose at Repository	1.4	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.4	CY	$11.38	$16	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe	1	LF	$80.83	$81	200'/day
	ACP Pavement, 4" thk	0.4	TON	$70.00	$25	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$19	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$6**	
	Total Direct Unit Cost			**$240.00**	**$242**	
3	**Install new 4' x 4' x 4' concrete inlet**	**1**	**EA**			
	Sawcut & Remove Pavement	16.0	SY	$12.55	$201	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	26.7	CY	$14.80	$395	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	26.7	CY	$5.49	$146	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	26.7	CY	$11.38	$303	use C8a cost
	Imported Fill Material	22.0	CY	$53.33	$1,175	imported, difficult operation
	Grate	1.0	EA	$250.00	$250	
	CIP Wall, 6" thk, 4' tall	1.2	CY	$737.64	$874	
	Wall Rebar @ 200 #/cy	237.0	LB	$1.79	$423	
	CIP Elevated Slab, 10" thk	0.8	CY	$737.64	$567	
	Wall Rebar @ 200 #/cy	153.7	LB	$1.79	$274	
	CIP Slab, 10" thk, 7' x 7' wide	0.8	CY	$295.88	$227	
	Footing Rebar @ 150 #/cy	115.3	LB	$1.79	$206	
	Misc Detail Allowance	10%	LS	$0.00	$459	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$502**	

TABLE D-25

Alternative RP-2: Kellogg Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Total Direct Unit Cost			**$6,004.00**	**$6,003**	
4	**Install 2' w x 1' h x 12' l rock water bars**	**5**	**EA**			4'w x 1'th
	Prep Channel Bank	0	LF	$86.03	$0	assume 2 days
	Imported Fill Material	4.44	CY	$62.91	$280	imported, difficult operation
	Misc Detail Allowance	15%	LS	$0.00	$42	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$4**	
	Total Direct Unit Cost			**$65.00**	**$325**	
5	**Regrade Gravel Road**	**1,070**	**LS**			5' cover
	Re-Grade Roadway	1426.7	SY	$3.10	$4,416	
	CSBC, 6" thk	237.8	CY	$31.26	$7,432	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$1,233	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$235**	
	Total Direct Unit Cost			**$13.00**	**$13,797**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards
TESC = temporary erosion sedimentation control

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-26

Alternative RP-2: Wardner Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Wardner/Sierra Nevada Road						
1	Construct 40' Of 36 Dia Cpe Pipe With 1' Of Cover	40	LF	$150	$6,000	$10,200
2	Construct 50' Of 36 Dia Cpe Pipe With 1' Of Cover	50	EA	$150	$7,500	$12,750
3	Install 12'X6.5' Cattle Guard W/ 10'X6'X4' Cast-In-Place Concrete Vault	2	EA	$25,100	$50,200	$85,340
					Subtotal Rounded	**$110,000**
	Npv For 30-Year O&M Cost					**$99,000**
	Total NPV cost at 30 years					**$209,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-27

Alternative RP-2: Wardner Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Wardner/Sierra Nevada Road						
1,2	**PIPELINE - 36" CHDPE, 1' COVER**	**1**	**LF**			3' cover
	Clear, Grub & Dispose	50.0	AC	$6,514.75	$1	
	Excavate Trench	0.8	CY	$3.92	$3	
	Bed & Zone	0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$2	
	Haul & Dispose at Repository	0.8	CY	$5.49	$5	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.8	CY	$11.38	$10	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe	1	LF	$80.83	$81	200'/day
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
Description	**Sales Tax on Materials**	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$146**	
3	**12'X6' CATTLE GUARD WITH CIP VAULT**	**1**	**EA**			
	10'x6' Cattle Guard	1.0	EA	$10,305.31	$10,305	Use $100/SF cost
	Grade existing pond bottom	140.0	SF	$3.14	$439	
	Excavate for walls	25.9	CY	$3.92	$102	
	Imported Backfill	8.1	CY	$29.94	$244	
	Haul & Dispose at Repository	25.9	CY	$5.49	$142	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	25.9	CY	$11.38	$295	use C8a cost
	CIP Wall, 12" thk, 4 ft tall	5.3	CY	$737.64	$3,934	
	Wall Rebar @ 200 #/cy	1066.7	LB	$1.79	$1,904	
	CIP Slab, 12" thk, 14'x10' including 1 foot beyond wall	5.2	CY	$295.88	$1,534	
	Footing Rebar @ 150 #/cy	777.8	LB	$1.79	$1,388	
	Misc Detail Allowance	20%	LS	$0.00	$4,058	
	Sales Tax on Materials	**5%**			**$717**	
	Total Direct Unit Cost			**$25,100.00**	**$25,063**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet

TABLE D-27

Alternative RP-2: Wardner Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

Description

TABLE D-28

Alternative RP-2: Osburn Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Shields Gulch						
1	Replace Existing 32"ø Cmp Culvert With 4'X6' Cmp Arch (Culvert 1)	14	LF	$780	$10,920	$18,564
2	Replace Existing 36"ø Concrete Culvert With 4'X6' Cmp Arch (Culvert 2)	25	LF	$780	$19,500	$33,150
3	Replace Existing 36"ø Cmp Culvert With 4'X6' Cmp Arch (Culvert 3)	50	LF	$780	$39,000	$66,300
4	Install New 4'X6' Cmp Arch Culvert (Culvert 4)	35	LF	$570	$19,950	$33,915
5	Reconstruct Right Channel Bank With 1' Berm (Xs 1)	65	LF	$411	$26,715	$45,416
6	Construct 12' X 4' X 4' Earthen Channel (Xs 2)	1890	LF	$57	$107,730	$183,141
7	Construct 25' X 15' X 5' Earthen Channel (Xs 3)	155	LF	$260	$40,300	$68,510
						$0
Rosebud Gulch						$0
1	Replace Existing Culverts (One 24"ø Cmp And Two 20"ø Cmp) With One 48"ø Cmp (Culvert 1)	130	LF	$620	$80,600	$137,020
2	Replace Existing Park Culvert With A 10.5' X 16' Single Span Bridge With A Clear Height Of 2' (Bridge 1)	1	EA	$95,000	$95,000	$161,500
3	Reconstruct Right Channel Bank With 1' Berm (Xs 1)	310	LF	$110	$34,100	$57,970
4	Reconstruct Existing Channel To 11' X 4' X 4' Earthen Channel (Xs 2 - A & B)	90	LF	$32	$2,880	$4,896
5	Reconstruct Existing Channel To 8.5' X 5.5' X 2' Earthen Channel (Xs 4)	1330	LF	$21	$27,930	$47,481
						$0
Meyer Creek						$0
1-10	Construct 24"ø Chdpe Pipe At An Average Depth Of 7 Ft	2835	LF	$210	$595,350	$1,012,095
11	Furnish And Install New 48"ø Manhole	9	EA	$4,600	$41,400	$70,380
12	Abandon 360 Lf Of Existing Meyer Creek Pipe-Leave Open For Storage	1	LS	$0	$0	$0
13	Modify Inlet Structure	1	LS	$97,874	$97,874	$166,386
					Subtotal Rounded	**$2,110,000**
	NPV for 30-year O&M Cost					**$745,000**
	Total NPV cost at 30 years					**$2,855,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Shields Gulch						
1,2,3	**REPLACE CULVERT WITH 4'X6' CMP ARCH**	**50**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	40	SY	$12.55	$502	
	Remove & Dispose Existing Culvert	30	LF	$7.84	$235	32 to 36" CMP or RCP
	Excavate Trench	83.2	CY	$7.84	$653	account for pipe removal & loading, less pipe
	Bed & Zone	44.2	CY	$46.86	$2,071	1/2 mile one way average
	Imported Backfill	32.0	CY	$24.94	$798	assume all wasted to repository
	Haul & Dispose at Repository	83.2	CY	$5.49	$457	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	83.2	CY	$11.38	$947	use C8a cost
	Trench Safety	30	LF	$5.00	$150	trench box
	Dewatering: Two Sump Pmps		HR	$12.00	$0	none requred
	4'x6' CMP Arch	30	LF	$360.72	$10,822	75'/day
	Headwall/Miter	1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch	40	SY	$22.00	$880	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$3,522	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$672**	
	Total Direct Unit Cost			**$780.00**	**$23,208**	
4	**NEW 4'X6' CMP ARCH CULVERT**	**35**	**LF**			3' cover
	Sawcut & Remove Pavement	46.7	SY	$12.55	$586	
	Remove & Dispose Existing Culvert	0	LF	$7.84	$0	not required
	Excavate Trench	105.2	CY	$3.92	$412	account for pipe removal & loading
	Bed & Zone	51.6	CY	$46.86	$2,416	1/2 mile one way average
	Imported Backfill	37.3	CY	$24.94	$930	assume all wasted to repository
	Haul & Dispose at Repository	105.2	CY	$5.49	$577	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	105.2	CY	$11.38	$1,197	use C8a cost
	Trench Safety	35	LF	$5.00	$175	trench box
	Dewatering: Two Sump Pmps		HR	$12.00	$0	none requred
	4'x6' CMP Arch	35	LF	$215.32	$7,536	75'/day, Material cost per The Guide
	Headwall/Miter	1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch	46.7	SY	$22.00	$1,027	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$2,916	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$464**	
	Total Direct Unit Cost			**$570.00**	**$19,737**	
5	**Reconstruct Right Channel Bank with 1' Berm**	**65**	**LF**			4'w x 1'th

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Prep Channel Bank	65	LF	$86.03	$5,592	assume 2 days
	Imported Fill Material	9.63	CY	$62.91	$606	imported, difficult operation
	Misc Detail Allowance	15%	LS	$0.00	$20,255	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$231**	
	Total Direct Unit Cost			**$411.00**	**$26,683**	
6	**Construct 12'x4'x4' Earthen Channel**	**1,890**	**LF**			
	Clear, Grub & Dispose	1.7	AC	$6,514.75	$11,307	
	Diversion/Care of Water	0	LF	$10.00	$0	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	2268	CY	$14.80	$33,562	25cy/hr to remove & load, small area
	Prep & Grade Channel	1890	LF	$7.84	$14,821	
	Haul & Dispose at Repository	2268	CY	$5.49	$12,451	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	2268	CY	$11.38	$25,810	use C8a cost
	Pea Gravel	0	CY	$19.88	$0	
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Misc Detail Allowance	15%	LS	$0.00	$8,954	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$57.00**	**$106,905**	
7	**Construct 25'x15'x5' Earthen Channel**	**155**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$927	
	Diversion/Care of Water	0	LF	$10.00	$0	allowance for temp dikes/facilities & bypass pumping
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	655.7	CY	$15.68	$10,283	25cy/hr to remove & load
	Prep & Grade Channel	155	LF	$7.84	$1,216	
	Haul & Dispose at Repository	655.7	CY	$5.49	$3,600	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	655.7	CY	$11.38	$7,461	use C8a cost
	Imported Fill Material	52.7	CY	$62.91	$3,312	imported, difficult operation
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Imported Fill Material	181.35	CY	$49.41	$8,961	imported, small operation
	Misc Detail Allowance	15%	LS	$0.00	$3,705	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$202**	

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Total Direct Unit Cost			**$260.00**	**$39,666**	
Rosebud Gulch						
1	**REPLACE MULTIPLE CULVERTS W/1-48" CMP CULVERT**	**130**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	642.8	SY	$12.55	$8,065	
	Remove & Dispose Existing Culvert, 1-24" & 2-20" CMP	390	LF	$3.92	$1,529	
	Excavate Trench	294.8	CY	$7.84	$2,312	account for pipe removal & loading, less pipe
	Bed & Zone	132.6	CY	$46.86	$6,214	1/2 mile one way average
	Imported Backfill	136.7	CY	$24.94	$3,409	assume all wasted to repository
	Haul & Dispose at Repository	294.8	CY	$5.49	$1,619	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	294.8	CY	$11.38	$3,355	use C8a cost
	Trench Safety	130	LF	$5.00	$650	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	48" CMP Pipe	130	LF	$182.34	$23,704	100'/day
	Headwall/Miter	1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch	642.8	SY	$22.00	$14,141	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$12,305	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$1,324**	
	Total Direct Unit Cost			**$620.00**	**$80,127**	
2	**REPLACE MULTIPLE CULVERT W/SINGLE SPAN BRIDGE**	**1**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	642.8	SY	$12.55	$8,065	
	Remove & Dispose Existing Culvert, 1-24" & 2-20" CMP	390	LF	$3.92	$1,529	
	Excavate Trench	294.8	CY	$7.84	$2,312	account for pipe removal & loading, less pipe
	Bed & Zone	132.6	CY	$46.86	$6,214	1/2 mile one way average
	Imported Backfill	136.7	CY	$24.94	$3,409	assume all wasted to repository
	Haul & Dispose at Repository	294.8	CY	$5.49	$1,619	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	294.8	CY	$11.38	$3,355	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	New Bridge & Abutments - Steel	168	SF	$300.00	$50,400	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$14,387	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$3,322**	
	Total Direct Unit Cost			**$95,000.00**	**$94,617**	

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
3	**RECONSTRUCT RIGHT CHANNEL BANK**	**310**	**LF**			see detail
	Prep Channel Bank	310	LF	$86.03	$26,668	difficult operation, assume 10 dys
	Imported Fill Material	62	CY	$62.91	$3,900	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$3,057	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$51**	
	Total Direct Unit Cost			**$110.00**	**$33,676**	
4	**Reconstruct Existing Channel to 11'x4'x4' Earthen Channel**	**90**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$538	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	4.5	CY	$15.68	$71	25cy/hr to remove & load
	Prep & Grade Channel	90	LF	$7.84	$706	
	Haul & Dispose at Repository	4.5	CY	$5.49	$25	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	4.5	CY	$11.38	$51	use C8a cost
	Imported Fill Material	19.4	CY	$62.91	$1,217	imported, difficult operation
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Misc Detail Allowance	10%	LS	$0.00	$253	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$16**	
	Total Direct Unit Cost			**$32.00**	**$2,877**	
5	**Reconstruct Existing Channel to 8.5'x5.5'x2' Earthen Channel**	**1,330**	**LF**			
	Clear, Grub & Dispose	1.2	AC	$6,514.75	$7,956	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	199.5	CY	$14.80	$2,952	
	Prep & Grade Channel	1330	LF	$7.84	$10,430	
	Haul & Dispose at Repository	199.5	CY	$5.49	$1,095	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	199.5	CY	$11.38	$2,270	use C8a cost
	Imported Fill Material	0	CY	$62.91	$0	imported, difficult operation
	Sand	0	CY	$19.88	$0	
	Liner/Geotextile System	0	SY	$4.97	$0	
	Misc Detail Allowance	10%	LS	$0.00	$2,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$21.00**	**$26,838**	

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments	
Meyer Creek							
1-10	**PIPELINE - 24"**	**1**	**LF**			5' cover	
	Sawcut & Remove Pavement	1.3	SY	$12.55	$17		
	Excavate Trench	1.6	CY	$3.92	$6		
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average	
	Imported Backfill	1.1	CY	$29.94	$33		
	Haul & Dispose at Repository	1.6	CY	$5.49	$9	assume all but rock is wasted, 5 mile 1 way	
	Repository Cost	1.6	CY	$11.38	$18	use C8a cost	
	Trench Safety	1	LF	$5.00	$5	trench box	
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA	
	Pipe, 24" Corrugated HDPE	1	LF	$58.67	$59	200'/day	
	Restoration - Base Course & Pavement Patch	1.3	SY	$22.00	$29	subcontract	
	Misc Detail Allowance	10%	LS	$0.00	$17	road maint & repair, testing, detection tape, etc	
	Sales Tax on Materials	**5%**			**$3**		
	Total Direct Unit Cost			**$210.00**	**$211**		
11	**MANHOLE, 48" DIA X 8'**	**1**	**EA**				
	Purchase & Install Manhole, Frame, Ring, Cover	1	EA	$4,068.40	$4,068		
	Misc Detail Allowance	10%	LS	$0.00	$407	invert	
	Sales Tax on Materials	**5%**			**$138**		
	Total Direct Unit Cost			**$4,600.00**	**$4,613**		
12	**ABANDON MEYER CREEK PIPE**	**360**	**LF**				
	Plug Ends with Concrete	0	EA	$250.00	$0	leave open, use as overflow storage	
	Misc Detail Allowance	20%	LS	$0.00	$0		
	Sales Tax on Materials	**5%**			**$0**		
	Total Direct Unit Cost			**$0.00**	**$0**		
13	**MODIFY INLET STRUCTURE**	**1**	**EA**				**$95,214**
	Riprap	40	CY	$72.91	$2,916	imported, difficult operation	
	12'x15' Steel Trash Rack at outlet	1	EA	$21,105.31	$21,105	Use $100/SF cost	
	Grade existing pond bottom	2000	SF	$3.14	$6,274		
	CIP Wall, 8" thk, 50 lf x 6 ft tall	7.4	CY	$737.64	$5,491		

TABLE D-29

Alternative RP-2: Osburn Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Wall Rebar @ 200 #/cy	1488.9	LB	$1.79	$2,658	
CIP Wall Footing, 2.5 wide x 1.5' tall	6.9	CY	$496.76	$3,450	
Footing Rebar @ 150 #/cy	1041.7	LB	$1.79	$1,859	
CIP Slab and sump, 10" thk	61.5	CY	$295.88	$18,191	
Footing Rebar @ 150 #/cy	9222.2	LB	$1.79	$16,463	
Crushed Gravel Driveway	30	CY	$31.26	$938	
Misc Detail Allowance	20%	LS	$0.00	$15,869	
Sales Tax on Materials	**5%**			**$2,660**	
Total Direct Unit Cost				**$97,874**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
HR = hour
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-30

Alternative RP-2: Silverton Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Revenue Gultch Alternative 2						
1	Replace Existing Culvert (48" Dia Cmp) With 56" Dia Cmp (Culvert 1)	38	LF	$540	$20,520	$34,884
2	Replace Existing Culvert (15 Lf Of 48" Dia Cmp) With 15'X32' Single Span Bridge W/ A Clear Height Of 5' (Bridge 1)	1	LS	$184,000	$184,000	$312,800
3	Replace Existing Culvert (48" Dia Cmp) W/ One 5.6'X7.9' Pipe Arch Cmp (Culvert 2)	32	LF	$810	$25,920	$44,064
4	Replace Existing Culvert (48" Dia Cmp) W/ One 6.1'X8.8' Pipe Arch Cmp (Culvert 3)	22	LF	$1,350	$29,700	$50,490
5	Replace Existing Culvert (Box Culvert) With One 3'X7.5' Box Culvert (Culvert 4)	550	LF	$1,054	$579,700	$985,490
6	Install/Construct Overflow Structure	1	LS	$72,500	$72,500	$123,250
7	Construct 235 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 1)	235	LF	$160	$37,600	$63,920
8	Construct 210 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 2)	210	LF	$160	$33,600	$57,120
9	Construct 210 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 3)	210	LF	$160	$33,600	$57,120
10	Construct 200 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 4)	200	LF	$160	$32,000	$54,400
11	Construct 80 Lf Of 36" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 5)	80	LF	$240	$19,200	$32,640
12	Construct 290 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 6)	290	LF	$290	$84,100	$142,970
13	Construct 225 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 7)	225	LF	$290	$65,250	$110,925
14	Construct 190 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 8)	190	LF	$290	$55,100	$93,670
15	Construct 190 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 9)	190	LF	$290	$55,100	$93,670
16	Construct 205 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 10)	205	LF	$290	$59,450	$101,065
17	Construct 185 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 11)	185	LF	$290	$53,650	$91,205
18	Construct 190 Lf Of 36" Dia Chdpe At An Avg Depth Of 7.5' To Invert (Pipe 12)	190	LF	$290	$55,100	$93,670
19	Construct 265 Lf Of 36" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 13)	265	LF	$240	$63,600	$108,120
20	Construct 265 Lf Of 36" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 14)	265	LF	$240	$63,600	$108,120
21	Construct 70 Lf Of 42" Dia Chdpe At An Avg Depth Of 5.5' To Invert (Pipe 15)	70	LF	$280	$19,600	$33,320
22	Furnish And Install New 48" Dia Manhole At A Depth Of 6' To 8'	14	EA	$4,890	$68,460	$116,382
23	Furnish And Install New Storm Drain	8	EA	$6,130	$49,040	$83,368
West of Western Avenue						
1	Construct 206 Lf Of 16" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 1)	206	LF	$150	$30,900	$52,530
2	Construct 220 Lf Of 16" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 2)	220	LF	$150	$33,000	$56,100
3	Construct 229 Lf Of 16" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 3)	229	LF	$150	$34,350	$58,395
4	Construct 192 Lf Of 18" Dia Chdpe At An Avg Depth Of 6' To Invert (Pipe 4)	192	LF	$160	$30,720	$52,224
5	Construct 196 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 5)	196	LF	$180	$35,280	$59,976
6	Construct 183 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 6)	183	LF	$180	$32,940	$55,998
7	Construct 192 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 7)	192	LF	$180	$34,560	$58,752
8	Construct 181 Lf Of 20" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 8)	181	LF	$180	$32,580	$55,386
9	Construct 200 Lf Of 22" Dia Chdpe At An Avg Depth Of 6.5' To Invert (Pipe 9)	200	LF	$200	$40,000	$68,000
10	Construct 544 Lf Of 22" Dia Chdpe At An Avg Depth Of 5' To Invert (Pipe 10)	544	LF	$150	$81,600	$138,720
11	Furnish And Install New 48" Dia Manhole At A Depth Of 6' To 8'	10	EA	$4,890	$48,900	$83,130
12	Furnish And Install New Storm Drain	20	EA	$6,130	$122,600	$208,420
Unnamed Creek						
1	Replace Existing Culvert (12" Cmp) With 22" Dia Cmp (Culvert 1)	24	LF	$290	$6,960	$11,832
2	Reconstruct Existing Channel To 12'X3'X3' Earthen Channel (Xs 1)	1115	LS	$43	$47,945	$81,507
					Subtotal Rounded	**$4,030,000**
	NPV for 30-year O&M Cost					**$1,340,000**
	Total NPV cost at 30 years					**$5,370,000**

Notes:

NPV = Net Present Value
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Revenue Gulch						
1	**REPLACE 48" CULVERTS W/ 56" CMP CULVERT**	**38**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	50.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-48" CMP	38	LF	$15.68	$596	
	Excavate Trench	101.1	CY	$7.84	$793	account for pipe removal & loading, less pipe
	Bed & Zone	35.4	CY	$46.86	$1,658	1/2 mile one way average
	Imported Backfill	41.6	CY	$24.94	$1,038	assume all wasted to repository
	Haul & Dispose at Repository	101.1	CY	$5.49	$555	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	101.1	CY	$11.38	$1,150	use C8a cost
	Trench Safety	38	LF	$5.00	$190	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	56" CMP Pipe	38	LF	$241.52	$9,178	75'/day
	Headwall/Miter	1	EA	$1,500.00	$1,500	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
Description	Misc Detail Allowance	20%	LS	$0.00	$2,990	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$535**	
	Total Direct Unit Cost			**$540.00**	**$20,183**	
2	**REPLACE MULTIPLE CULVERT W/ 15'x32' SINGLE SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	53.3	SY	$12.55	$669	
	Remove & Dispose Existing Culvert, 1-48" CMP	15	LF	$15.68	$235	
	Excavate Trench	45.1	CY	$7.84	$353	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	45.1	CY	$5.49	$247	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	45.1	CY	$11.38	$513	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	New Bridge & Abutments - Steel	480	SF	$300.00	$144,000	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$29,052	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$8,640**	
	Total Direct Unit Cost			**$184,000.00**	**$183,710**	
3	**REPLACE 48" CULVERTS W/ 5.6'x7.9' ARCH CULVERT**	**32**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	0.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-48" CMP	32	LF	$15.68	$502	
	Excavate Trench	147.2	CY	$7.84	$1,154	account for pipe removal & loading, less pipe

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Bed & Zone	62.1	CY	$46.86	$2,909	1/2 mile one way average
	Imported Backfill	54.4	CY	$24.94	$1,357	assume all wasted to repository
	Haul & Dispose at Repository	147.2	CY	$5.49	$808	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	147.2	CY	$11.38	$1,675	use C8a cost
	Trench Safety	32	LF	$5.00	$160	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	95"x67" Arch CMP Culert	32	LF	$335.88	$10,748	50'/day, Material cost per The Guide
	Headwall/Miter	1	EA	$2,000.00	$2,000	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$3,766	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$656**	
	Total Direct Unit Cost			**$810.00**	**$25,735**	
4	**REPLACE 48" CULVERTS W/ 6.1'x8.8' ARCH CULVERT**	**22**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
Description						
	Sawcut & Remove Pavement	0.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-48" CMP	22	LF	$15.68	$345	
	Excavate Trench	214.9	CY	$7.84	$1,686	account for pipe removal & loading, less pipe
	Bed & Zone	91.1	CY	$46.86	$4,269	1/2 mile one way average
	Imported Backfill	66.8	CY	$24.94	$1,667	assume all wasted to repository
	Haul & Dispose at Repository	214.9	CY	$5.49	$1,180	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	214.9	CY	$11.38	$2,446	use C8a cost
	Trench Safety	22	LF	$5.00	$110	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	112"x75" Arch CMP Culert	22	LF	$497.76	$10,951	25'/day, Material cost per The Guide
	Headwall/Miter	1	EA	$2,000.00	$2,000	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$4,205	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$628**	
	Total Direct Unit Cost			**$1,350.00**	**$29,487**	
5	**REPLACE EXISTING BOX CULVERT W/3'x7.5' BOX CULVERT**	**550**	**LF**			
	Demo ACP Roadway	305.6	SY	$12.55	$3,834	275' of length under roadway
	Remove & Dispose Existing Box Culvert	550	LF	$31.37	$17,252	
	Excavate Channel	1161.1	CY	$5.92	$6,873	
	Imported Fill Material	702.8	CY	$24.94	$17,529	imported
	Haul & Dispose at Repository	1161.1	CY	$5.57	$6,472	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1161.1	CY	$11.38	$13,213	use C8a cost
	CIP Wall, 8" thk, 3 ft tall	81.9	CY	$737.64	$60,405	

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments	
	Wall Rebar @ 200 #/cy	16378	LB	$1.79	$29,236		
	CIP Elv Slab, 7.5' wide x 8" Thk	204.7	CY	$664.70	$136,079		
	Elv Slab Rebar @ 200 #/cy	40944	LB	$1.79	$73,090		
	CIP Slab, 7.5' wide x 10" thk	204.7	CY	$295.88	$60,573		
	Footing Rebar @ 150 #/cy	30708	LB	$1.79	$54,818		
	ACP Pavement, 4" thk	70	TON	$70.00	$4,877		
	CSBC, 6" thk	51	CY	$31.26	$1,592		
	Flagger	200	HR	$60.14	$12,028		
	Misc Detail Allowance	15%	LS	$0.00	$72,698	access.TESC, restoration, etc	
	Sales Tax on Materials	**5%**			**$9,232**		
	Total Direct Unit Cost			**$1,054.00**	**$579,801**		
6	**OVERFLOW STRUCTURE**	**1**	**EA**				**$70,211**
	Riprap	18.5	CY	$72.91	$1,350	imported, difficult operation	
Description	20'x6' Steel Trash Rack at outlet	1.0	EA	$15,105.31	$15,105	Use $100/SF cost	
	Grade existing pond bottom	950.0	SF	$3.14	$2,980		
	Excavate for walls	44.6	CY	$3.92	$175		
	Imported Backfill	25.5	CY	$29.94	$763		
	Haul & Dispose at Repository	44.6	CY	$5.49	$245	assume all but rock is wasted, 5 mile 1 way	
	Repository Cost	44.6	CY	$11.38	$507	use C8a cost	
	Sluice Gate, 36"x36"	1.0	EA	$17,217.04	$17,217		
	CIP Wall, 12" thk, 6 ft tall	9.6	CY	$737.64	$7,049		
	Wall Rebar @ 200 #/cy	1911.1	LB	$1.79	$3,412		
	CIP Wall Footing, 3 wide x 2' tall	9.6	CY	$496.76	$4,747		
	Footing Rebar @ 150 #/cy	1433.3	LB	$1.79	$2,559		
	CIP Slab, 12" thk	4.3	CY	$295.88	$1,260		
	Footing Rebar @ 150 #/cy	638.9	LB	$1.79	$1,140		
	Misc Detail Allowance	20%	LS	$0.00	$11,702		
	Sales Tax on Materials	**5%**			**$2,339**		
	Total Direct Unit Cost			**$72,500.00**	**$72,549**		
7-10	**PIPELINE - 18" CHDPE, 6' TO INVERT**	**1**	**LF**			4.5' cover	
	Demo ACP Roadway	1.4	SY	$12.55	$17		
	Excavate Trench	1.1	CY	$3.92	$4		
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average	
	Imported Backfill	0.7	CY	$29.94	$22		
	Haul & Dispose at Repository	1.1	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way	
	Repository Cost	1.1	CY	$11.38	$12	use C8a cost	
	Trench Safety	1	LF	$5.00	$5	trench box	
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA	

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$160.00**	**$158**	
11,19,20	**PIPELINE - 36" CHDPE, 6' TO INVERT**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.6	SY	$12.55	$20	
	Excavate Trench	1.4	CY	$3.92	$6	
	Bed & Zone	0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$20	
	Haul & Dispose at Repository	1.4	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.4	CY	$11.38	$16	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe	1	LF	$80.83	$81	200'/day
	ACP Pavement, 4" thk	0.4	TON	$70.00	$25	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$19	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$6**	
	Total Direct Unit Cost			**$240.00**	**$242**	
12-18	**PIPELINE - 36" CHDPE, 7.5' TO INVERT**	**1**	**LF**			4.5' cover
	Demo ACP Roadway	1.9	SY	$12.55	$24	
	Excavate Trench	2.1	CY	$3.92	$8	
	Bed & Zone	0.5	CY	$46.86	$24	1/2 mile one way average
	Imported Backfill	1.3	CY	$29.94	$39	
	Haul & Dispose at Repository	2.1	CY	$5.49	$11	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	2.1	CY	$11.38	$24	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 36" CPE Pipe	1	LF	$80.83	$81	200'/day
	ACP Pavement, 4" thk	0.4	TON	$70.00	$30	
	CSBC, 6" thk	0.3	CY	$31.26	$10	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$23	road maint & repair, testing, detection tape, etc

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Sales Tax on Materials	**5%**			**$7**	
	Total Direct Unit Cost			**$290.00**	**$290**	
21	**PIPELINE - 42" CHDPE, 5.5' TO INVERT**	**1**	**LF**			2' cover
	Demo ACP Roadway	1.5	SY	$12.55	$19	
	Excavate Trench	1.4	CY	$3.92	$5	
	Bed & Zone	0.6	CY	$46.86	$29	1/2 mile one way average
	Imported Backfill	0.4	CY	$29.94	$12	
	Haul & Dispose at Repository	1.4	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.4	CY	$11.38	$16	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 42" CPE Pipe	1	LF	$118.68	$119	150'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$24	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.11	HR	$60.14	$6	
	Misc Detail Allowance	10%	LS	$0.00	$23	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$7**	
	Total Direct Unit Cost			**$280.00**	**$280**	
22	**MANHOLE 48" 6 TO 8 FT DEPTH**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C8a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
23	**FURNISH AND INSTALL STORM DRAIN AND INLET**	**1**	**EA**			3' cover, 25 ft long
	Demo ACP Roadway	26.4	SY	$12.55	$331	
	Excavate Trench	17.1	CY	$3.92	$67	
	Bed & Zone	7.0	CY	$46.86	$328	1/2 mile one way average
	Imported Backfill	8.5	CY	$29.94	$254	
	Haul & Dispose at Repository	17.1	CY	$5.49	$94	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	17.1	CY	$11.38	$195	use C8a cost
	Trench Safety	25	LF	$5.00	$125	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	25	LF	$30.71	$768	350'/day
	Grated concrete inlet structure	1	EA	$2,758.50	$2,759	
	ACP Pavement, 4" thk	6.0	TON	$70.00	$421	
	CSBC, 6" thk	4.4	CY	$31.26	$137	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$519	road maint & repair, testing, detection tape, etc
Description						
	Sales Tax on Materials	**5%**			**$129**	
	Total Direct Unit Cost			**$6,130.00**	**$6,131**	
West of Western Avenue						
1-3	**PIPELINE - 16" CHDPE, 6' TO INVERT**	**1**	**LF**			4.5' cover
	Demo ACP Roadway	1.4	SY	$12.55	$17	
	Excavate Trench	1.0	CY	$3.92	$4	
	Bed & Zone	0.3	CY	$46.86	$12	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$22	
	Haul & Dispose at Repository	1.0	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.0	CY	$11.38	$12	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 16" CPE Pipe (Price as 15" CPE)	1	LF	$26.63	$27	350'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$151**	
4	**PIPELINE - 18" CHDPE, 6' TO INVERT**	**1**	**LF**			4.5' cover
	Demo ACP Roadway	1.4	SY	$12.55	$17	
	Excavate Trench	1.1	CY	$3.92	$4	

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.7	CY	$29.94	$22	
	Haul & Dispose at Repository	1.1	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.1	CY	$11.38	$12	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$160.00**	**$158**	
5-9	**PIPELINE - 20" CHDPE, 6.5' TO INVERT**	**1**	**LF**			4.83' cover
	Demo ACP Roadway	1.5	SY	$12.55	$19	
	Excavate Trench	1.3	CY	$3.92	$5	
	Bed & Zone	0.3	CY	$46.86	$14	1/2 mile one way average
	Imported Backfill	0.9	CY	$29.94	$27	
	Haul & Dispose at Repository	1.3	CY	$5.49	$7	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.3	CY	$11.38	$15	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 20" CPE Pipe	1	LF	$36.41	$36	330'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$24	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$14	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$4**	
	Total Direct Unit Cost			**$180.00**	**$181**	
10	**PIPELINE - 22" CHDPE, 5' TO INVERT**	**1**	**LF**			4.83' cover
	Demo ACP Roadway	1.1	SY	$12.55	$14	
	Excavate Trench	0.8	CY	$3.92	$3	
	Bed & Zone	0.3	CY	$46.86	$14	1/2 mile one way average
	Imported Backfill	0.4	CY	$29.94	$11	
	Haul & Dispose at Repository	0.8	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.8	CY	$11.38	$9	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 22" CPE Pipe (Price as 24" CPE)	1	LF	$45.65	$46	330'/day
	ACP Pavement, 4" thk	0.3	TON	$70.00	$18	
	CSBC, 6" thk	0.2	CY	$31.26	$6	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$147**	
11	**MANHOLE 48" 6 TO 8 FT DEPTH**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C8a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	
12	**FURNISH AND INSTALL STORM DRAIN AND INLET**	**1**	**EA**			3' cover, 25 ft long
	Demo ACP Roadway	26.4	SY	$12.55	$331	
	Excavate Trench	17.1	CY	$3.92	$67	
	Bed & Zone	7.0	CY	$46.86	$328	1/2 mile one way average
	Imported Backfill	8.5	CY	$29.94	$254	
	Haul & Dispose at Repository	17.1	CY	$5.49	$94	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	17.1	CY	$11.38	$195	use C8a cost
	Trench Safety	25	LF	$5.00	$125	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	25	LF	$30.71	$768	350'/day
	Grated concrete inlet structure	1	EA	$2,758.50	$2,759	
	ACP Pavement, 4" thk	6.0	TON	$70.00	$421	
	CSBC, 6" thk	4.4	CY	$31.26	$137	

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Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$519	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$129**	
	Total Direct Unit Cost			**$6,130.00**	**$6,131**	
Unnamed Creek						
1	**REPLACE 12" CULVERTS W/ 22" CMP CULVERT**	**24**	**LF**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	0.0	SY	$12.55	$0	
	Remove & Dispose Existing Culvert, 1-18" CMP	24	LF	$10.46	$251	
	Excavate Trench	19.8	CY	$7.84	$155	account for pipe removal & loading, less pipe
	Bed & Zone	7.9	CY	$46.86	$369	1/2 mile one way average
	Imported Backfill	9.5	CY	$24.94	$238	assume all wasted to repository
	Haul & Dispose at Repository	19.8	CY	$5.49	$108	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.8	CY	$11.38	$225	use C8a cost
	Trench Safety	24	LF	$5.00	$120	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	none requred
	56" CMP Pipe	24	LF	$124.52	$2,988	75'/day
	Headwall/Miter	1	EA	$1,200.00	$1,200	allowance
	Restoration - Base Course & Pavement Patch	0.0	SY	$22.00	$0	subcontract
	Misc Detail Allowance	20%	LS	$0.00	$1,064	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$151**	
	Total Direct Unit Cost			**$290.00**	**$6,869**	
2	**Reconstruct Exist Channel w/ 12' w x 3' d, XS 1**	**1,115**	**LF**			
	Clear, Grub & Dispose	1.0	AC	$6,514.75	$6,670	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	929.2	CY	$14.80	$13,750	
	Prep & Grade Channel	1,115	LF	$7.84	$8,744	
	Haul & Dispose at Repository	929.2	CY	$5.49	$5,101	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	929.2	CY	$11.38	$10,574	use C8a cost
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$2,916	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$0**	
	Total Direct Unit Cost			**$43.00**	**$47,755**	

Notes:

TABLE D-31

Alternative RP- 2: Silverton Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
CIP = cast-in-place					
CY = cubic yards					
EA = each					
HR = hour					
LB = pound(s)					
LS = lump sum					
SF = square feet					
SY = square yards					
NOTE: The above costs are presented rounded to three significant figures					
NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).					
NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.					

Description

TABLE D-32

Alternative RP-2: Wallace Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
Printer's Creek						
1	Furnish And Install New 10' Deep, 5' Diameter Precast Manhole	1	EA	$7,630	$7,630	$12,971
2	Remove Existing Inlet Structure	1	LS	$9,900	$9,900	$16,830
3	Construct New Inlet Structure	1	LS	$41,000	$41,000	$69,700
					Subtotal Rounded	**$100,000**
	Npv For 30-Year O&M Cost					**$99,000**
	Total NPV cost at 30 years					**$199,000**

Notes:

NPV = Net Present Value
EA = each
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-33

Alternative RP-2: Wallace Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
Printer's Creek						
1	**MANHOLE 5' DIAMETER, 10 FT DEPTH**	**50**	**EA**			
	Demo ACP Roadway	9.0	SY	$12.55	$113	
	Excavate Trench	30.0	CY	$3.92	$118	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	22.7	CY	$29.94	$681	
	Haul & Dispose at Repository	30.0	CY	$5.49	$165	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	30.0	CY	$11.38	$341	use C8a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	60" Manhole, 10 feet deep	1	EA	$4,718.35	$4,718	
	ACP Pavement, 4" thk	2.1	TON	$70.00	$144	
	CSBC, 6" thk	1.5	CY	$31.26	$47	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$633	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$163**	
	Total Direct Unit Cost			**$7,630.00**	**$7,628**	
2	**REMOVE EXISTING INLET STRUCTURE**	**1**	**EA**			
	Demo Existing inlet structure	1	LS	$6,273.60	$6,274	
	Haul & Dispose	1	LS	$1,891.84	$1,892	assume all is wasted, 5 mile 1 way
	Misc Detail Allowance	20%	LS	$0.00	$1,633	
	Sales Tax on Materials	**5%**			**$132**	
	Total Direct Unit Cost			**$9,900.00**	**$9,930**	
3	**NEW INLET STRUCTURE AT PRINTER'S CREEK**	**1**	**EA**			
	Riprap	15	CY	$72.91	$1,080	imported, difficult operation
	20'x6' Steel Trash Rack at outlet	1	EA	$15,105.31	$15,105	Use $100/SF cost
	Grade existing pond bottom	400	SF	$3.14	$1,255	
	Excavate for walls	30	CY	$3.92	$116	
	Imported Backfill	16	CY	$29.94	$466	
	Haul & Dispose at Repository	30	CY	$5.49	$163	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	30	CY	$11.38	$337	use C8a cost
	CIP Wall, 12" thk, 8 ft tall	7	CY	$737.64	$5,464	
	Wall Rebar @ 200 #/cy	1481	LB	$1.79	$2,645	
	CIP Wall Footing, 2' wide x 2' tall	7	CY	$496.76	$3,312	
	Footing Rebar @ 150 #/cy	1000	LB	$1.79	$1,785	

TABLE D-33

Alternative RP-2: Wallace Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
CIP Slab, 12" thk	3	CY	$295.88	$767	
Footing Rebar @ 150 #/cy	389	LB	$1.79	$694	
Misc Detail Allowance	20%	LS	$0.00	$6,638	
Sales Tax on Materials	**5%**			**$1,196**	
Total Direct Unit Cost			**$41,000.00**	**$41,023**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SY = square yards

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-34

Alternative RP-2: Mullan Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
3rd Street Neighborhood						
1	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes)	3400	LF	$25	$85,000	$144,500
2	Install 55 Lf Of 24" Dia Rcp Pipe, 2' Cover With Asphalt Reconstruction	55	LF	$160	$8,800	$14,960
3	Remove Existing Culvert And Install 40 Lf Of 24" Dia Rcp (Culvert 1), 1 Ft Cover With Pavement Restoration	40	LF	$150	$6,000	$10,200
4	Remove Existing Culvert And Install 40 Lf Of 24" Dia Rcp (Culvert 2), 1 Ft Cover With Pavement Restoration	40	LF	$150	$6,000	$10,200
5	Remove Existing Culvert And Install 25 Lf Of 24" Dia Rcp (Culvert 3), 1 Ft Cover With Pavement Restoration	25	LF	$150	$3,750	$6,375
6	Remove Existing Culvert And Install 40 Lf Of 24" Dia Rcp (Culvert 4), 1 Ft Cover With Pavement Restoration	40	LF	$150	$6,000	$10,200
7	Furnish And Install New 48" Dia Manhole At 6 Ft Depth	1	LF	$4,890	$4,890	$8,313
8	Furnish And Install New 48" Catch Basin With Sump	2	LF	$4,890	$9,780	$16,626
Tiger Creek						
1	Construct Concrete Inlet Structure (See Plan 316-1, Case A With 8' Long X 4' Tall Wingwalls And 3' Long X 4' Tall Headwalls)	1	EA	$24,600	$24,600	$41,820
2	Install 175 Lf Of 24" Cmp. 1 Ft Cover With Sod Surface Restoration	175	LF	$130	$22,750	$38,675
3	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes)	750	LF	$25	$18,750	$31,875
4	Install 30 Lf Of 24" Rcp (Culvert 1). 1 Ft Cover With Pavement Restoration	30	LF	$150	$4,500	$7,650
5	Install 30 Lf Of 24" Rcp (Culvert 2). 1 Ft Cover With Pavement Restoration	30	LF	$150	$4,500	$7,650
6	Install Rip Rap At Outfall	10	CY	$82	$820	$1,394
						$0
Mill Creek						$0
1	Regrade And Vegetate 140 Lf Of Stream Banks	140	LF	$33	$4,620	$7,854
2	Construct 4' High X 4' Long Concrete Wingwalls At Culvert Enterance	2	EA	$4,510	$9,020	$15,334
3	Reconstruct Existing Concrete Open Channel (2.5' H X 4.33' W) To 3' H X 6' W Concrete Channel	175	LF	$574	$100,450	$170,765
4	Construct 325 Lf Of 3.5' H X 6' W Concrete Box Culvert Along New Alignment (Culvert 1). Remove 80 Lf Of Existing 3' H X 6' W Concrete Box	325	LF	$624	$202,800	$344,760
5	Plug And Fill Existing Culvert (80 Lf Of 3' X 6' Concrete Box Culvert And 100 Lf Of 58" Dia Cmp) With Cdf	1	LS	$27,025	$27,025	$45,943
6	Install Rip Rap At Culvert 1 Outfall	10	CY	$82	$820	$1,394
7	Replace Two Existing 32" Cpe Culvert In Parallel With 15' W X 25' L Precast Concrete Bridge With Footings And Clear Hieght Of 2.5 Ft (Bridge 1)	1	EA	$160,000	$160,000	$272,000
8	Replace Two Existing 36" Cpe Culvert In Parallel With 15' W X 20' L Precast Concrete Bridge With Footings And Clear Hieght Of 2.5 Ft (Bridge 2)	2	EA	$128,000	$256,000	$435,200
9	Excavate And Regrade 50 Lf Of Existing Gravel Road To Provide 1.5 Ft Rolling Dip	1	LS	$1,880	$1,880	$3,196
Mill Street						
1	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along South Side Of Mill Street	960	LF	$25	$24,000	$40,800
2	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along North Side Of Mill Street	925	LF	$25	$23,125	$39,313
3	Construct 10' X 2' X 3 Rock Lined Ditch (Xs 1)	390	LF	$101	$39,390	$66,963
4	Install 60 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 1)	60	LF	$110	$6,600	$11,220
5	Install 80 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 2)	80	LF	$110	$8,800	$14,960
6	Install 30 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 3)	30	CY	$110	$3,300	$5,610
7	Install 50 Lf Of 15" Dia Rcp Pipe With 2 Ft Of Cover (Culvert 4)	50	EA	$110	$5,500	$9,350
8	Install Two (2) 25 Lf 15" Rcp Culverts With 2 Ft Of Cover (Culvert 5 & 6)	1	LS	$5,500	$5,500	$9,350
9	Install Two (2) 50 Lf 18" Rcp Culverts With 1.5 Ft Of Cover (Culvert 7 & 9)	1	LS	$12,000	$12,000	$20,400
10	Install 25 Lf Of 18" Dia Cpe Culvert With 1.5 Ft Cover (Culvert 8)	25	LF	$120	$3,000	$5,100
11	Install 25 Lf Of 30" Dia Cpe Culvert Under Trail Of Coeur D'Alenes (Culvert 10). 3 Ft Cover With Pavement Surface Restoration	25	LF	$210	$5,250	$8,925
12	Install New Dual Inlet Catch Basin (Itd Catch Basin Type 6) With 4' Sump	1	EA	$5,367	$5,367	$9,124
13	Install 15 Cy Rip Rap At Outfall To South Fork Coeur D'Alene River	15	CY	$82	$1,230	$2,091
						$0
Dewey Street Area						$0
1	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes) Along N Side Of Lower Dewey St	100	LF	$25	$2,500	$4,250
2	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes) Along E Side Of Lower Dewey St (Daylight To Hunter St)	280	LF	$25	$7,000	$11,900
3	Construct Asphalt Lined Ditch (2.5' Deep With 1:1 Side Slopes) Along E Side Of Lower Dewey St (Daylight To Mill St)	365	LF	$25	$9,125	$15,513

TABLE D-34

Alternative RP-2: Mullan Cost Summary

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	2009 Total Direct and Indirect Capital Cost
4	Install 25 Lf Of 18" Rcp (Culvert 1). 1.5 Ft Cover With Pavement Restoration	25	LF	$120	$3,000	$5,100
5	Install 25 Lf Of 18" Rcp (Culvert 2). 1.5 Ft Cover With Pavement Restoration	25	LF	$120	$3,000	$5,100
6	Install 25 Lf Of 18" Rcp (Culvert 3). 1.5 Ft Cover With Gravel Restoration	25	LF	$100	$2,500	$4,250
7	Replace Existing Catch Basin New 4' Deep Inlet With Sump	6	EA	$4,890	$29,340	$49,878
8	Replace 12" Dia Storm Sewer With 18" Dia Cpe Pipe With 3 Ft Of Cover	650	LF	$120	$78,000	$132,600
Copper Street Neighborhood						
1	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along South Side Of Idaho Street	400	LF	$25	$10,000	$17,000
2	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along Idaho Street East And West Sides Of Eighth Street	1100	LF	$25	$27,500	$46,750
3	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along North Side Of Oregon Street	205	LF	$25	$5,125	$8,713
4	Construct Asphalt Lined Ditch (2.5 Ft Deep With 1:1 Side Slopes) Along Montana Street	305	LF	$25	$7,625	$12,963
5	Install Six (6) 25 Lf 18" Rcp Culverts With 1.5 Ft Of Cover (Culvert 1 Through 6)	1	LS	$18,000	$18,000	$30,600
6	Install Seven (7) 20 Lf 18" Rcp Culverts With 1.5 Ft Of Cover (Culvert 7 Through 13)	1	LS	$16,800	$16,800	$28,560
7	Install 310 Lf Of 48" Cmp Culvert With 3.5 Ft Of Cover (Culvert 14 And 15)	310	LF	$400	$124,000	$210,800
8	Install 915 Lf Of New 24" Cpe Storm Pipe With 4 Ft Of Cover	915	LF	$210	$192,150	$326,655
9	Remove Existing Drywell, 4 Exsiting Catch Basins, And 285 Lf Of Existing Storm Drain Pipe Along Idaho Street	1	LS	$17,680	$17,680	$30,056
10	Furnish And Install New 6' X 6' Concrete Manhole At A Depth Of 8 Ft	1	EA	$11,676	$11,676	$19,849
11	Furnish And Install New 48" Dia Storm Manhole At A Depth Of 6 Ft	4	EA	$4,890	$19,560	$33,252
12	Furnish And Install New Catch Basin With 4' Sump	6	EA	$4,890	$29,340	$49,878
13	Install 15 Cy Rip Rap At Culvert/Pipe Outfall	30	CY	$82	$2,460	$4,182
South End Of 2nd Street						
1	Construct 10'X4'X3' Rock Lined Ditch Along West Side Of Second Street (Xs 1)	110	LF	$108	$11,880	$20,196
2	Construct 10'X4'X3' Rock Lined Ditch Along South Side Of The Trail Of The Coeur D'Alenes (Xs 1)	655	LF	$108	$70,740	$120,258
3	Install 60 Lf Of New 18" Dia Cpe Pipe With 3 Ft Of Cover	60	LF	$120	$7,200	$12,240
4	Install 20 Lf Of New 18" Dia Cpe Pipe Under Trail Of Coeur D'Alenes (Culvert 1). 3 Ft Of Cover With Pavement Surface Restoration.	20	LF	$120	$2,400	$4,080
5	Install New Dual Inlet Catch Basin (Itd Cathc Basin Type 6) With 4 Ft Sump.	1	EA	$5,367	$5,367	$9,124
6	Install Rip Rap At Outfall To Mill Creek	15	CY	$82	$1,230	$2,091
					Subtotal Rounded	**$3,110,000**
	NPV for 30-year O&M Cost					**$1,080,000**
	Total NPV cost at 30 years					**$4,190,000**

Notes:

NPV = Net Present Value
CY = cubic yards
EA = each
LF = linear feet
LS = lump sum
O&M = operation and maintenance

Assumptions:

All excavated material is hauled to repository and replaced with imported material.
Pipe cover is 3' over pipe
All work will be performed in the summer and therefore no water issues exist.
See estimate details for additional assumptions
Total indirect cost assumes 70% of Total Direct Capital Cost

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
3rd Street Neighborhood						
1	**CONSTRUCT ASPHALT LINED DITCH (2.5 DEEP W/ 1:1 SLOPES)**	**3,400**	**LF**			
	Clear, Grub & Dispose	50.0	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C8a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
Description	**Total Direct Unit Cost**			**$25.00**	**$81,907**	
2	**PIPELINE - 24" RCP, 2' COVER PAVEMENT RESTORATION**	**1**	**LF**			2' cover
	Demo ACP Roadway	1.0	SY	$12.55	$13	
	Excavate Trench	0.7	CY	$3.92	$3	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.2	CY	$29.94	$6	
	Haul & Dispose at Repository	0.7	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.7	CY	$11.38	$8	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$16	
	CSBC, 6" thk	0.2	CY	$31.26	$5	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$13	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$4**	
	Total Direct Unit Cost			**$160.00**	**$163**	
3-6	**PIPELINE - 24" RCP, 1' COVER PAVEMENT RESTORATION**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.8	SY	$12.55	$10	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$2	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$6	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$147**	
Description						
7,8	**MANHOLE 48" 6 TO 8 FT DEPTH**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C8a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	
Tiger Creek						
1	**NEW INLET STRUCTURE AT TIGER CREEK**	**1**	**EA**			
	Riprap	14.8	CY	$72.91	$1,080	imported, difficult operation
	20'x6' Steel Trash Rack at outlet	1.0	EA	$9,105.31	$9,105	Use $100/SF cost
	Grade existing pond bottom	400.0	SF	$3.14	$1,255	
	Excavate for walls	14.1	CY	$3.92	$55	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Imported Backfill	6.2	CY	$29.94	$186	
	Haul & Dispose at Repository	14.1	CY	$5.49	$77	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	14.1	CY	$11.38	$160	use C8a cost
	CIP Wall, 12" thk, 4 ft tall	2.8	CY	$737.64	$2,076	
	Wall Rebar @ 200 #/cy	563.0	LB	$1.79	$1,005	
	CIP Wall Footing, 2' wide x 2' tall	5.0	CY	$496.76	$2,502	
	Footing Rebar @ 150 #/cy	755.6	LB	$1.79	$1,349	
	CIP Slab, 12" thk	2.0	CY	$295.88	$592	
	Footing Rebar @ 150 #/cy	300.0	LB	$1.79	$536	
	Misc Detail Allowance	20%	LS	$0.00	$3,996	
	Sales Tax on Materials	**5%**			**$653**	
	Total Direct Unit Cost			**$24,600.00**	**$24,627**	
Description						
2	**PIPELINE - 24" RCP, 1' COVER SOD RESTORATION**	**1**	**LF**			1' cover
	Clear, Grub & Dispose	0.0	AC	$6,514.75	$4	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$2	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$6	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	SOD	1.6	SY	$4.50	$7	
	Topsoil, 6" thk	0.3	CY	$27.94	$7	
	Flagger	0.00	HR	$60.14	$0	
	Misc Detail Allowance	10%	LS	$0.00	$11	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$130.00**	**$133**	
3	**CONSTRUCT ASPHALT LINED DITCH (2.5 DEEP W/ 1:1 SLOPES)**	**3,400**	**LF**			
	Clear, Grub & Dispose	2.3	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way

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Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Repository Cost	787.0	CY	$11.38	$8,956	use C8a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	
4,5	**PIPELINE - 24" RCP, 1' COVER PAVEMENT RESTORATION**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.8	SY	$12.55	$10	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.4	CY	$46.86	$17	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$2	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$6	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" RCP Pipe	1	LF	$65.97	$66	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$12	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$150.00**	**$147**	
6	**RIP RAP**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	
Mill Creek						
1	**REGRADE AND REVEGATE STREAM BANKS**	**140**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$838	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	0.0	CY	$14.80	$0	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Prep & Grade Channel	140	LF	$7.84	$1,098	
	Haul & Dispose at Repository	0.0	CY	$5.49	$0	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.0	CY	$11.38	$0	use C8a cost
	Planting along stream banks	140	LF	$15.00	$2,100	allowance
	Misc Detail Allowance	10%	LS	$0.00	$404	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$116**	
	Total Direct Unit Cost			**$33.00**	**$4,554**	
2	**CONSTRUCT 4' H x 4' L WINGWALLS AT CULVERT**	**1**	**EA**			
	Riprap	8	CY	$72.91	$608	imported, difficult operation
	Grade existing pond bottom	225	SF	$3.14	$706	
	Excavate for walls	5	CY	$3.92	$19	
	Imported Backfill	2	CY	$29.94	$71	
	Haul & Dispose at Repository	5	CY	$5.49	$26	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	5	CY	$11.38	$54	use C8a cost
	CIP Wall, 12" thk, 4 ft tall	1	CY	$737.64	$874	
	Wall Rebar @ 200 #/cy	237	LB	$1.79	$423	
	CIP Wall Footing, 2' wide x 2' tall	1	CY	$496.76	$589	
	Footing Rebar @ 150 #/cy	178	LB	$1.79	$317	
	Misc Detail Allowance	20%	LS	$0.00	$737	
	Sales Tax on Materials	**5%**			**$83**	
	Total Direct Unit Cost			**$4,510.00**	**$4,507**	
3	**RECONSTURCT CHANNEL W/ 3' H WALL, 6' W CONCRETE CHANNEL**	**175**	**LF**			
	Clear, Grub & Dispose	0.2	AC	$6,514.75	$1,047	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing 2.5' H x 4.33' W	175	LF	$11.84	$2,072	
	Excavate Channel	137.2	CY	$14.80	$2,031	
	Prep & Grade Channel	175	LF	$7.84	$1,372	
	Haul & Dispose at Repository	137.2	CY	$5.49	$753	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	137.2	CY	$11.38	$1,562	use C8a cost
	Imported Fill Material	38.9	CY	$53.33	$2,074	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	38.9	CY	$737.64	$28,686	
	Wall Rebar @ 200 #/cy	7777.8	LB	$1.79	$13,884	
	CIP Slab, 12" thk, 10' wide	65	CY	$295.88	$19,177	
	Footing Rebar @ 150 #/cy	9,722	LB	$1.79	$17,355	
	Misc Detail Allowance	10%	LS	$0.00	$8,770	access.TESC, restoration, etc

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Sales Tax on Materials	**5%**			**$1,531**	
	Total Direct Unit Cost			**$574.00**	**$100,315**	
4	**CONSTRUCT 3.5' H x 6' W CONCRETE BOX CULVERT**	**325**	**LF**			
	Clear, Grub & Dispose	0.3	AC	$6,514.75	$1,944	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Demo existing 3' H x 6' W	80	LF	$11.84	$947	
	Excavate Channel	379.2	CY	$14.80	$5,611	
	Prep & Grade Channel	325	LF	$7.84	$2,549	
	Haul & Dispose at Repository	379.2	CY	$5.49	$2,082	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	379.2	CY	$11.38	$4,315	use C8a cost
	Imported Fill Material	84.3	CY	$53.33	$4,493	imported, difficult operation
	CIP Wall, 12" thk, 3' tall	84.3	CY	$737.64	$62,153	
	Wall Rebar @ 200 #/cy	16851.9	LB	$1.79	$30,082	
	CIP Slab, 12" thk, 10' wide	120	CY	$295.88	$35,615	
	Footing Rebar @ 150 #/cy	18,056	LB	$1.79	$32,231	
	Misc Detail Allowance	10%	LS	$0.00	$17,563	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$3,072**	
	Total Direct Unit Cost			**$624.00**	**$202,657**	
5	**PLUG AND FILL EXISTING CULVERT**	**1**	**LS**			
	Fill 3'x6' culvert with CDF	53	CY	$100.00	$5,333	leave open, use as overflow storage
	Pumping Costs	53	CY	$80.82	$4,310	
	Fill 58" Dia CMP with CDF	68	CY	$100.00	$6,786	leave open, use as overflow storage
	Pumping Costs	68	CY	$80.82	$5,485	
	Misc Detail Allowance	20%	LS	$0.00	$4,383	
	Sales Tax on Materials	**5%**			**$727**	
	Total Direct Unit Cost			**$27,025.00**	**$27,024**	
6	**RIP RAP**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
7	**REPLACE EXISTING CULVERT W/ NEW 15'x25' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	41.7	SY	$12.55	$523	
	Remove & Dispose Exist Culverts	1	LS	$591.92	$592	
	Excavate Trench	48.6	CY	$7.84	$381	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	48.6	CY	$5.49	$267	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	48.6	CY	$11.38	$553	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall +1 bury	3.2	CY	$737.64	$2,391	
	Wall Rebar @ 200 #/cy	648.1	LB	$1.79	$1,157	
	CIP Wall, 12" thk, 2.5' tall +1 bury	3.2	CY	$737.64	$2,391	
	Wall Rebar @ 200 #/cy	648.1	LB	$1.79	$1,157	
	CIP Wall Footing, 2.5 wide x 1.5' tall	6.9	CY	$496.76	$3,450	
	Footing Rebar @ 150 #/cy	1041.7	LB	$1.79	$1,859	
	New Bridge & Abutments - Concrete	375	SF	$300.00	$112,500	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$25,280	minor traffic control, TESC, etc
	Sales Tax on Materials	**5%**			**$6,977**	
	Total Direct Unit Cost			**$160,000.00**	**$159,478**	
8	**REPLACE EXISTING CULVERT W/ NEW 15'x20' SPAN BRIDGE**	**1**	**EA**			3' cover, done in summer, no dewatering needed, keep one lane open
	Sawcut & Remove Pavement	33.3	SY	$12.55	$418	
	Remove & Dispose Exist Culverts	1	LS	$591.92	$592	
	Excavate Trench	38.9	CY	$7.84	$305	account for pipe removal & loading, less pipe
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	0.0	CY	$9.94	$0	assume all wasted to repository
	Haul & Dispose at Repository	38.9	CY	$5.49	$214	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	38.9	CY	$11.38	$443	use C8a cost
	Trench Safety	0	LF	$5.00	$0	trench box
	CIP Wall, 12" thk, 2.5' tall +1 bury	2.6	CY	$737.64	$1,912	
	Wall Rebar @ 200 #/cy	518.5	LB	$1.79	$926	
	CIP Wall, 12" thk, 2.5' tall +1 bury	2.6	CY	$737.64	$1,912	
	Wall Rebar @ 200 #/cy	518.5	LB	$1.79	$926	
	CIP Wall Footing, 2.5 wide x 1.5' tall	5.6	CY	$496.76	$2,760	
	Footing Rebar @ 150 #/cy	833.3	LB	$1.79	$1,488	
	New Bridge & Abutments - Concrete	300	SF	$300.00	$90,000	based on road & bridge file
	Misc Detail Allowance	20%	LS	$0.00	$20,248	minor traffic control, TESC, etc

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Sales Tax on Materials	**5%**			**$5,582**	
	Total Direct Unit Cost			**$128,000.00**	**$127,724**	
9	**EXCAVATE AND REGRADE GRAVEL ROAD**	**1**	**LS**			5' cover
	Excavate Roadway	34.7	CY	$3.92	$136	
	Place Excavated Material Backfill	34.7	CY	$9.94	$345	
	Trench Safety	0	LF	$5.00	$0	trench box
	CSBC, 6" thk	23.1	CY	$31.26	$724	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$169	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$23**	
	Total Direct Unit Cost			**$1,880.00**	**$1,878**	
Mill Street						
1,2	**CONSTRUCT ASPHALT LINED DITCH (2.5 DEEP W/ 1:1 SLOPES)**	**3,400**	**LF**			
	Clear, Grub & Dispose	2.3	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C8a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	
3	**CONSTRUCT 10'x2'x3' ROCK LINED DITCH**	**390**	**LF**			
	Clear, Grub & Dispose	0.4	AC	$6,514.75	$2,333	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	693.3	CY	$14.80	$10,260	
	Prep & Grade Channel	390	LF	$7.84	$3,058	
	Haul & Dispose at Repository	693.3	CY	$5.49	$3,806	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	693.3	CY	$11.38	$7,890	use C8a cost

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Imported Fill Material	173.3	CY	$53.33	$9,244	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$2,490	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$143**	
	Total Direct Unit Cost			**$101.00**	**$39,224**	
4-9	**PIPELINE - 15" RCP, 2' COVER**	**1**	**LF**			2' cover
	Demo ACP Roadway	0.8	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.2	CY	$46.86	$12	1/2 mile one way average
	Imported Backfill	0.2	CY	$29.94	$5	
	Haul & Dispose at Repository	0.5	CY	$5.49	$2	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 15" RCP Pipe	1	LF	$35.75	$36	350'/day
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$9	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$110.00**	**$106**	
10	**PIPELINE - 18" RCP, 1.5' COVER PAVEMENT RESTORATION**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.06	HR	$60.14	$4	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$120.00**	**$116**	
11	**PIPELINE - 30" CPE, 3' COVER PAVEMENT RESTORATION**	**1**	**LF**			2' cover
	Demo ACP Roadway	1.4	SY	$12.55	$17	
	Excavate Trench	1.1	CY	$3.92	$5	
	Bed & Zone	0.4	CY	$46.86	$20	1/2 mile one way average
	Imported Backfill	0.5	CY	$29.94	$16	
	Haul & Dispose at Repository	1.1	CY	$5.49	$6	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.1	CY	$11.38	$13	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 30" CPE Pipe	1	LF	$74.25	$74	RS Means 334113502040
	ACP Pavement, 4" thk	0.3	TON	$70.00	$22	
	CSBC, 6" thk	0.2	CY	$31.26	$7	
	Flagger	0.08	HR	$60.14	$5	
	Misc Detail Allowance	10%	LS	$0.00	$17	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$5**	
	Total Direct Unit Cost			**$210.00**	**$213**	
12	**Install New Dual Inlet Catch Basin with 4' Sump**	**1**	**EA**			
	Sawcut & Remove Pavement	8.3	SY	$12.55	$105	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	20.8	CY	$14.80	$308	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	20.8	CY	$5.49	$114	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	20.8	CY	$11.38	$237	use C8a cost
	Imported Fill Material	17.0	CY	$53.33	$907	imported, difficult operation
	Grate	1	EA	$250.00	$250	
	CIP Wall, 6" thk, 7' tall	2.1	CY	$737.64	$1,530	
	Wall Rebar @ 200 #/cy	414.8	LB	$1.79	$740	
	CIP Slab, 6" thk, 5.5' x 2.5' wide	0.5	CY	$295.88	$151	
	Footing Rebar @ 150 #/cy	76.4	LB	$1.79	$136	
	CIP Gutter Slab, 6" thk	0.2	CY	$295.88	$55	
	Footing Rebar @ 150 #/cy	27.8	LB	$1.79	$50	
	Misc Detail Allowance	10%	LS	$0.00	$423	access.TESC, restoration, etc

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Sales Tax on Materials	**5%**			**$360**	
	Total Direct Unit Cost			**$5,367.00**	**$5,367**	
13	**RIP RAP**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	
Dewey Street Area						
1-3	**CONSTRUCT ASPHALT LINED DITCH (2.5 DEEP W/ 1:1 SLOPES)**	**3,400**	**LF**			
	Clear, Grub & Dispose	2.3	AC	$6,514.75	$15,255	
Description	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C8a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	
4,5	**PIPELINE - 18" RCP, 1.5' COVER PAVEMENT RESTORATION**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.06	HR	$60.14	$4	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$120.00**	**$116**	
6	**PIPELINE - 18" RCP, 1.5' COVER GRAVEL RESTORATION**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.03	HR	$60.14	$2	
	Misc Detail Allowance	10%	LS	$0.00	$8	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$100.00**	**$101**	
7	**MANHOLE 48" 6 TO 8 FT DEPTH**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C8a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	
8	**PIPELINE - 18" CHDPE, 3' COVER**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.1	SY	$12.55	$13	
	Excavate Trench	0.7	CY	$3.92	$3	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.3	CY	$29.94	$10	
	Haul & Dispose at Repository	0.7	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.7	CY	$11.38	$8	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.2	TON	$70.00	$17	
	CSBC, 6" thk	0.2	CY	$31.26	$5	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$120.00**	**$124**	
Copper Street Neighborhood						
1-4	**CONSTRUCT ASPHALT LINED DITCH (2.5 DEEP W/ 1:1 SLOPES)**	**3,400**	**LF**			
	Clear, Grub & Dispose	2.3	AC	$6,514.75	$15,255	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	787.0	CY	$14.80	$11,647	
	Prep & Grade Ditch	3,400	LF	$3.92	$13,331	
	Haul & Dispose at Repository	787.0	CY	$5.49	$4,321	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	787.0	CY	$11.38	$8,956	use C8a cost
	ACP Pavement, 2" thk	301.5	TON	$70.00	$21,103	
	Imported Fill Material	0.0	CY	$53.33	$0	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$6,134	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$1,161**	
	Total Direct Unit Cost			**$25.00**	**$81,907**	
5,6	**PIPELINE - 18" RCP, 1.5' COVER PAVEMENT RESTORATION**	**1**	**LF**			1' cover
	Demo ACP Roadway	0.7	SY	$12.55	$9	
	Excavate Trench	0.5	CY	$3.92	$2	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.1	CY	$29.94	$4	
	Haul & Dispose at Repository	0.5	CY	$5.49	$3	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.5	CY	$11.38	$5	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" RCP Pipe	1	LF	$44.92	$45	RS Means 334113502040
	ACP Pavement, 4" thk	0.2	TON	$70.00	$12	
	CSBC, 6" thk	0.1	CY	$31.26	$4	
	Flagger	0.06	HR	$60.14	$4	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$2**	
Description	**Total Direct Unit Cost**			**$120.00**	**$116**	
7	**PIPELINE - 48" CMP, 3.5' COVER PAVEMENT RESTORATION**	**1**	**LF**			2' cover
	Demo ACP Roadway	2.0	SY	$12.55	$25	
	Excavate Trench	2.4	CY	$3.92	$9	
	Bed & Zone	0.7	CY	$46.86	$34	1/2 mile one way average
	Imported Backfill	1.2	CY	$29.94	$35	
	Haul & Dispose at Repository	2.4	CY	$5.49	$13	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	2.4	CY	$11.38	$27	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 48" CMP Pipe	1	LF	$161.36	$161	RS Means 334113402200
	ACP Pavement, 4" thk	0.5	TON	$70.00	$32	
	CSBC, 6" thk	0.3	CY	$31.26	$10	
	Flagger	0.10	HR	$60.14	$6	
	Misc Detail Allowance	10%	LS	$0.00	$32	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$11**	
	Total Direct Unit Cost			**$400.00**	**$401**	
8	**PIPELINE - 24" CPE, 4' COVER PAVEMENT RESTORATION**	**1**	**LF**			4' cover
	Demo ACP Roadway	1.6	SY	$12.55	$20	
	Excavate Trench	1.5	CY	$3.92	$6	
	Bed & Zone	0.4	CY	$46.86	$20	1/2 mile one way average
	Imported Backfill	0.9	CY	$29.94	$27	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Haul & Dispose at Repository	1.5	CY	$5.49	$8	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	1.5	CY	$11.38	$17	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 24" CPE Pipe	1	LF	$47.54	$48	RS Means 334113502040
	ACP Pavement, 4" thk	0.4	TON	$70.00	$26	
	CSBC, 6" thk	0.3	CY	$31.26	$8	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$16	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$5**	
	Total Direct Unit Cost			**$210.00**	**$209**	
9	**REMOVE DRYWELL, CB's, AND STORM DRAIN ALONG IDAHO STR**	**1**	**LF**			2' cover
	Demo Drywell	1	EA	$392.10	$392	
	Demo Catchbasin	4	EA	$784.20	$3,137	
	Demo Existing Storm Drain	285	EA	$9.94	$2,834	
	Imported Backfill to fill in removals	190	CY	$29.94	$5,689	
	Trench Safety	285	LF	$5.00	$1,425	trench box
	Flagger	40	HR	$60.14	$2,406	
	Misc Detail Allowance	10%	LS	$0.00	$1,588	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$209**	
	Total Direct Unit Cost			**$17,680.00**	**$17,679**	
10	**INSTALL NEW 6' x 6' CONCRETE MANHOLE, 8FT DEPTH**	**1**	**EA**			
	Sawcut & Remove Pavement	16.0	SY	$12.55	$201	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	48.0	CY	$14.80	$710	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	48.0	CY	$5.49	$264	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	48.0	CY	$11.38	$546	use C8a cost
	Imported Fill Material	33.9	CY	$53.33	$1,809	imported, difficult operation
	Grate	1.0	EA	$250.00	$250	
	CIP Wall, 6" thk, 8' tall	3.6	CY	$737.64	$2,623	
	Wall Rebar @ 200 #/cy	711.1	LB	$1.79	$1,269	
	CIP Elevated Slab, 10" thk	1.5	CY	$737.64	$1,111	
	Wall Rebar @ 200 #/cy	301.3	LB	$1.79	$538	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	CIP Slab, 10" thk, 7' x 7' wide	1.5	CY	$295.88	$446	
	Footing Rebar @ 150 #/cy	225.9	LB	$1.79	$403	
	Misc Detail Allowance	10%	LS	$0.00	$936	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$570**	
	Total Direct Unit Cost			**$11,676.00**	**$11,676**	
11,12	**MANHOLE 48" 6 TO 8 FT DEPTH**	**1**	**EA**			
	Demo ACP Roadway	7.1	SY	$12.55	$89	
	Excavate Trench	19.0	CY	$3.92	$74	
	Bed & Zone	0.0	CY	$46.86	$0	1/2 mile one way average
	Imported Backfill	15.2	CY	$29.94	$456	
	Haul & Dispose at Repository	19.0	CY	$5.49	$104	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	19.0	CY	$11.38	$216	use C8a cost
	Trench Safety	1	EA	$25.00	$25	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	48" Manhole	1	EA	$2,776.78	$2,777	
	ACP Pavement, 4" thk	1.6	TON	$70.00	$113	
	CSBC, 6" thk	1.2	CY	$31.26	$37	
	Flagger	8.00	HR	$60.14	$481	
	Misc Detail Allowance	10%	LS	$0.00	$405	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$112**	
	Total Direct Unit Cost			**$4,890.00**	**$4,890**	
13	**RIP RAP**	**1**	**EA**			
	Riprap	1	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
	Total Direct Unit Cost			**$82.00**	**$82**	
South End of 2nd Street						
1,2	**CONSTRUCT 10'x4'x3' ROCK LINED DITCH**	**110**	**LF**			
	Clear, Grub & Dispose	0.1	AC	$6,514.75	$658	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Channel	195.6	CY	$14.80	$2,894	
	Prep & Grade Channel	110	LF	$7.84	$863	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

	Description	Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Haul & Dispose at Repository	195.6	CY	$5.49	$1,074	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	195.6	CY	$11.38	$2,225	use C8a cost
	Imported Fill Material	61.1	CY	$53.33	$3,259	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$767	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$50**	
	Total Direct Unit Cost			**$108.00**	**$11,790**	
3,4	**PIPELINE - 18" CHDPE, 3' COVER**	**1**	**LF**			3' cover
	Demo ACP Roadway	1.1	SY	$12.55	$13	
	Excavate Trench	0.7	CY	$3.92	$3	
	Bed & Zone	0.3	CY	$46.86	$13	1/2 mile one way average
	Imported Backfill	0.3	CY	$29.94	$10	
	Haul & Dispose at Repository	0.7	CY	$5.49	$4	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	0.7	CY	$11.38	$8	use C8a cost
	Trench Safety	1	LF	$5.00	$5	trench box
	Dewatering: Two Sump Pmps	0	HR	$12.00	$0	NA
	Pipe, 18" CPE Pipe	1	LF	$30.71	$31	350'/day
	ACP Pavement, 4" thk	0.2	TON	$70.00	$17	
	CSBC, 6" thk	0.2	CY	$31.26	$5	
	Flagger	0.05	HR	$60.14	$3	
	Misc Detail Allowance	10%	LS	$0.00	$10	road maint & repair, testing, detection tape, etc
	Sales Tax on Materials	**5%**			**$3**	
	Total Direct Unit Cost			**$120.00**	**$124**	
5	**Install New Dual Inlet Catch Basin with 4' Sump**	**1**	**EA**			
	Sawcut & Remove Pavement	8.3	SY	$12.55	$105	
	Diversion/Care of Water	0	LF	$10.00	$0	
	Diversion Piping - Temporary: 36" dia Equiv	0	LF	$10.39	$0	
	Excavate Catch Basin	20.8	CY	$14.80	$308	
	Prep & Grade Channel	0	LF	$7.84	$0	
	Haul & Dispose at Repository	20.8	CY	$5.49	$114	assume all but rock is wasted, 5 mile 1 way
	Repository Cost	20.8	CY	$11.38	$237	use C8a cost
	Imported Fill Material	17.0	CY	$53.33	$907	imported, difficult operation
	Grate	1.0	EA	$250.00	$250	
	CIP Wall, 6" thk, 7' tall	2.1	CY	$737.64	$1,530	
	Wall Rebar @ 200 #/cy	414.8	LB	$1.79	$740	
	CIP Slab, 6" thk, 5.5' x 2.5' wide	0.5	CY	$295.88	$151	

TABLE D-35

Alternative RP-2: Mullan Detailed Unit Cost

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

		Quantity	Unit	2009 Direct Capital Unit Cost	2009 Total Direct Capital Cost	Comments
	Footing Rebar @ 150 #/cy	76.4	LB	$1.79	$136	
	CIP Gutter Slab, 6" thk	0.2	CY	$295.88	$55	
	Footing Rebar @ 150 #/cy	27.8	LB	$1.79	$50	
	Misc Detail Allowance	10%	LS	$0.00	$423	access.TESC, restoration, etc
	Sales Tax on Materials	**5%**			**$360**	
	Total Direct Unit Cost			**$5,367.00**	**$5,367**	
6	**RIP RAP**	**1**	**EA**			
	Riprap	1.0	CY	$72.91	$73	imported, difficult operation
	Misc Detail Allowance	10%	LS	$0.00	$7	
	Sales Tax on Materials	**5%**			**$2**	
Description	**Total Direct Unit Cost**			**$82.00**	**$82**	

Notes:

CIP = cast-in-place
CY = cubic yards
EA = each
LB = pound(s)
LS = lump sum
SF = square feet
SY = square yards

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-36

Alternative RP-2: Approximate Cost for Side Gulches

Typical Side Gulch Cost

Length of Stream that Fronts or Flows Through Remediate Areas[1] (LF)	Length of Channel Improvements[2] (LF)	Direct Capital Unit Cost[3]	Direct Capital Cost	Indirect Capital Cost[4]	O&M Cost (30 YR NPV)[5]	Total Cost (30-YR NPV)
2,700	1,200	$ 291	$ 349,000	$ 244,000	$ 228,000	$ 821,000

Approximate Number of Crossings[6]	Length of Culvert Replacement[7] (LF)	Direct Capital Unit Cost[3]	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 YR NPV)[5]	Total Cost (30-YR NPV)
4	104	$ 682	$ 71,000	$ 50,000	$ 46,000	$ 167,000

Surface Water Improvements[9]	Qty	Direct Capital Unit Cost[3]	Direct Capital Cost	Indirect Capital Cost	O&M Cost (30 YR NPV)[5]	Total Cost (30-YR NPV)
Assume 1 per typcial side gulch	1	$ 181,000	$ 181,000	$ 127,000	$ 118,000	$ 426,000
Total for Typical Side Gulch			$ 601,000	$ 421,000	$ 392,000	$ 1,414,000
TOTAL APPROXIMATE COST for Side Gulches[11]			**$ 6,410,000**	**$ 4,490,000**	**$ 4,180,000**	**$ 15,100,000**

Notes:

LF = linear feet

NPV = net present value

[1] Length of stream that fronts or flows through remediated areas is based on GIS analysis. This value (3,000 LF) is an average length for all side gulches (see Table 9, Appendix G).

[2] Length of expected channel improvements for a typical side gulch assumes 45% of length of stream fronting or flowing through remediated areas would require improvements. This assumption is based on the development of remedy protection projects using hydrologic and hydraulic modeling for Alternative RP-2 in the eight Upper Basin communities. (TerraGraphics *Side Gulches Cost Memorandum in preparation*)

[3] Direct unit capital cost for channel improvements is based on average direct capital unit cost for channel hydraulic capacity improvements included in Alternative RP-2 for the eight Upper Basin communities. (CH2M HILL *Side Gulches Cost Memorandum in preparation*)

[4] Indirect capital cost assumes 70% of direct capital costs.

[5] O&M Cost (30 Year NPV) assumes 38% of total capital cost. This assumption is based on O&M costs calculated in development of remedy protection projects in eight Upper Basin communities. (CH2M HILL *Side Gulches Cost Memorandum in preparation*)

[6] Approximate number of crossing is based on average for side gulches (see Table 9, Appendix G). Assumes all crosssings are culverts.

[7] Typical culvert (or crossing) assumes a two-lane road (24-ft) with shoulders (20-ft) and rip-rap headwalls (8-ft). Assumes 50% of crossings would require culvert replacement. This assumption is based on the development of Alternative RP-2 projects using hydrologic and hydraulic modeling for the eight Upper Basin communities. (TerraGraphics *Side Gulches Cost Memorandum in preparation*)

[8] Direct unit cost for culvert replacement is based on average unit cost for culvert replacement technologies included in Alternative RP-2 for the eight Upper Basin communities. (CH2M HILL *Side Gulches Cost Memorandum in preparation*)

[9] Surface water improvements assumes that a typical side gulch would need some degree of drainage improvements to reduce scour potential. The typical side gulch cost assumes one surface water improvement project for each side gulch.

[10] Direct unit cost is based on average unit cost for surface water improvement projects included in Alternative RP-2 for the eight Upper Basin communities. These projects include multiple neighborhoods in Mullan, Printer's Creek (Wallace), Portland Road (Kellogg), and Sierra Nevada Road (Wardner). (CH2M HILL *Side Gulches Cost Memorandum in preparation*)

[11] The total approximate cost for side gulches assumes 67% of side gulches will actually require remedy protection actions. This assumption is based on the analyses conducted during the characterization of the risk posed to the Selected Remedies in the eight Upper Basin communities. Bunker Creek and Government Creek are not included. (TerraGraphics *Side Gulches Cost Memorandum in preparation*)

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
BigCrkSeg01	POL044	BLM Polygon	Upland waste rock (erosion potential)	C02c	$4,470	$3,130	$7,600	$1,030	$8,630
	POL052	BLM Polygon	Floodplain waste rock	C01	$19,300	$13,500	$32,800	$0	$32,800
				C07	$67,600	$47,300	$114,900	$14,900	$129,800
BigCrkSeg03	POL001	BLM Polygon	Floodplain waste rock	C02c	$5,070	$3,550	$8,620	$1,170	$9,790
	POL002	BLM Polygon	Floodplain waste rock	C01	$7,140	$5,000	$12,140	$0	$12,140
				C07	$25,000	$17,500	$42,500	$5,500	$48,000
	POL067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
	POL068	BLM Polygon	Upland waste rock (erosion potential)	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
BigCrkSeg04	BIG04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$97,800	$237,800	$41,900	$279,700
				CD-AVG	$35,000	$24,500	$59,500	$10,500	$70,000
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				VBS-AVG	$59,500	$41,700	$101,200	$17,900	$119,100
	BIG04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$573,000	$401,000	$974,000	$172,000	$1,146,000
				CD-AVG	$247,000	$173,000	$420,000	$74,200	$494,200
				CD-SED	$26,200	$18,300	$44,500	$157,000	$201,500
				FP/RP-AVG	$432,000	$302,000	$734,000	$77,700	$811,700
				OFFCH-AVG	$832,000	$582,000	$1,414,000	$150,000	$1,564,000
				VBS-AVG	$244,000	$171,000	$415,000	$73,300	$488,300
	KLE025	BLM Polygon	Floodplain tailings - inactive Facilities	C09	$5,930,000	$4,150,000	$10,080,000	$1,190,000	$11,270,000
	KLE026	BLM Polygon	Floodplain waste rock	C02c	$182,000	$127,000	$309,000	$41,800	$350,800
	KLE027	BLM Polygon	Upland waste rock (erosion potential)	C01	$391,000	$274,000	$665,000	$0	$665,000
				C07	$1,370,000	$958,000	$2,328,000	$301,000	$2,629,000
	KLE047	BLM Polygon	Floodplain sediments	C01b	$43,900	$30,700	$74,600	$0	$74,600
				C08a	$58,800	$41,200	$100,000	$8,230	$108,230
				HAUL-2	$18,200	$12,800	$31,000	$0	$31,000
	KLE053	BLM Polygon	Floodplain waste rock	C01	$826,000	$578,000	$1,404,000	$0	$1,404,000
				C07	$2,890,000	$2,020,000	$4,910,000	$636,000	$5,546,000
	KLE054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$672,000	$471,000	$1,143,000	$0	$1,143,000
				C07	$2,350,000	$1,650,000	$4,000,000	$518,000	$4,518,000
	KLE071	BLM Polygon	Floodplain sediments	C01b	$517,000	$362,000	$879,000	$0	$879,000
				C08a	$694,000	$486,000	$1,180,000	$97,100	$1,277,100
				HAUL-2	$215,000	$151,000	$366,000	$0	$366,000
	KLE073	BLM Polygon	Floodplain sediments	C01b	$1,320,000	$924,000	$2,244,000	$0	$2,244,000
				C08a	$1,770,000	$1,240,000	$3,010,000	$248,000	$3,258,000
				HAUL-2	$549,000	$384,000	$933,000	$0	$933,000
	POL008	BLM Polygon	Floodplain waste rock	C01	$34,300	$24,000	$58,300	$0	$58,300
				C07	$120,000	$84,000	$204,000	$26,400	$230,400
	POL010	BLM Polygon	Upland waste rock (erosion potential)	C01	$19,200	$13,400	$32,600	$0	$32,600
				C07	$67,000	$46,900	$113,900	$14,700	$128,600

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	POL011	BLM Polygon	Floodplain waste rock	C01	$13,100	$9,170	$22,270	$0	$22,270
				C07	$45,900	$32,100	$78,000	$10,100	$88,100
	POL022	BLM Polygon	Floodplain waste rock	C02c	$12,700	$8,870	$21,570	$2,910	$24,480
	POL066	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
CCSeg	PIPECC	General Feature	Source General Information	PIPE-1	$1,050,000	$735,000	$1,785,000	$84,000	$1,869,000
				PIPE-2	$54,100	$37,900	$92,000	$4,330	$96,330
				PIPE-3	$2,380,000	$1,670,000	$4,050,000	$191,000	$4,241,000
				PIPE-4	$3,330,000	$2,330,000	$5,660,000	$267,000	$5,927,000
CCSeg01	BUR105	BLM Polygon	Upland waste rock (erosion potential)	C01	$27,300	$19,100	$46,400	$0	$46,400
				C03	$60,800	$42,500	$103,300	$7,290	$110,590
	BUR109	BLM Polygon	Upland waste rock (erosion potential)	C01	$23,000	$16,100	$39,100	$0	$39,100
				C03	$257,000	$180,000	$437,000	$30,800	$467,800
	BUR185	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$69,800	$48,800	$118,600	$8,370	$126,970
	BUR187	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$56,300	$39,400	$95,700	$6,750	$102,450
	THO023	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$42,800	$29,900	$72,700	$5,130	$77,830
CCSeg02	BUR107	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C01	$117,000	$81,700	$198,700	$0	$198,700
				C04	$594,000	$416,000	$1,010,000	$137,000	$1,147,000
	BUR130	BLM Polygon	Upland waste rock (erosion potential)	C01	$2,520	$1,760	$4,280	$0	$4,280
				C03	$536,000	$375,000	$911,000	$64,300	$975,300
	BUR132	BLM Polygon	Upland waste rock (erosion potential)	C01	$77,300	$54,100	$131,400	$0	$131,400
				C03	$376,000	$263,000	$639,000	$45,100	$684,100
	BUR133	BLM Polygon	Upland waste rock (erosion potential)	C01	$22,300	$15,600	$37,900	$0	$37,900
				C07	$77,900	$54,500	$132,400	$17,100	$149,500
	BUR134	BLM Polygon	Upland waste rock (erosion potential)	C01	$60,500	$42,300	$102,800	$0	$102,800
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	BUR135	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$131,000	$91,400	$222,400	$15,700	$238,100
	BUR145	BLM Polygon	Upland waste rock (erosion potential)	C01	$235,000	$165,000	$400,000	$0	$400,000
				C07	$823,000	$576,000	$1,399,000	$181,000	$1,580,000
	BUR150	BLM Polygon	Floodplain waste rock	C01	$27,400	$19,200	$46,600	$0	$46,600
				C03	$306,000	$214,000	$520,000	$36,700	$556,700
	BUR153	BLM Polygon	Floodplain sediments	C01b	$231,000	$162,000	$393,000	$0	$393,000
				C08a	$310,000	$217,000	$527,000	$43,400	$570,400
				HAUL-2	$96,100	$67,300	$163,400	$0	$163,400
	CC02-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$243,000	$170,000	$413,000	$72,800	$485,800
				CD-AVG	$123,000	$86,100	$209,100	$36,900	$246,000

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				CD-SED	$12,300	$8,640	$20,940	$74,100	$95,040
				FP/RP-AVG	$889,000	$622,000	$1,511,000	$160,000	$1,671,000
				VBS-AVG	$172,000	$121,000	$293,000	$51,700	$344,700
CCSeg03	BUR087	BLM Polygon	Upland waste rock (erosion potential)	C01	$52,500	$36,800	$89,300	$0	$89,300
				C03	$873,000	$611,000	$1,484,000	$105,000	$1,589,000
	BUR088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
	BUR089	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	BUR090	BLM Polygon	Upland tailings	C01	$126,000	$88,200	$214,200	$0	$214,200
				C07	$441,000	$309,000	$750,000	$97,000	$847,000
			Upland waste rock (erosion potential)	C01	$46,200	$32,300	$78,500	$0	$78,500
				C03	$2,360,000	$1,650,000	$4,010,000	$283,000	$4,293,000
	BUR099	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
	BUR146	BLM Polygon	Floodplain sediments	C01b	$337,000	$236,000	$573,000	$0	$573,000
				C08a	$451,000	$316,000	$767,000	$63,200	$830,200
				HAUL-2	$140,000	$98,000	$238,000	$0	$238,000
	BUR149	BLM Polygon	Upland waste rock (erosion potential)	C01	$8,740	$6,120	$14,860	$0	$14,860
				C03	$115,000	$80,300	$195,300	$13,800	$209,100
	BUR166	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$74,300	$52,000	$126,300	$8,910	$135,210
	BUR180	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,620	$3,230	$7,850	$0	$7,850
				C03	$51,800	$36,200	$88,000	$6,210	$94,210
CCSeg04	BUR066	BLM Polygon	Upland waste rock (erosion potential)	C01	$5,880	$4,120	$10,000	$0	$10,000
				C03	$67,500	$47,300	$114,800	$8,100	$122,900
	BUR067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$950,000	$1,020,000	$1,970,000	$56,700	$2,026,700
			Upland tailings	C01	$10,500	$7,350	$17,850	$0	$17,850
				C07	$36,800	$25,700	$62,500	$8,090	$70,590
			Upland waste rock (potential intermixed tailings)	C01	$735,000	$515,000	$1,250,000	$0	$1,250,000
				C03	$1,070,000	$748,000	$1,818,000	$128,000	$1,946,000
				C07	$2,570,000	$1,800,000	$4,370,000	$566,000	$4,936,000
	BUR068	BLM Polygon	Upland waste rock (erosion potential)	C01	$50,400	$35,300	$85,700	$0	$85,700
				C07	$176,000	$123,000	$299,000	$38,800	$337,800
	BUR072	BLM Polygon	Upland waste rock (erosion potential)	C03	$392,000	$274,000	$666,000	$47,000	$713,000
	BUR073	BLM Polygon	Upland waste rock (erosion potential)	C01	$106,000	$74,100	$180,100	$0	$180,100
				C03	$1,190,000	$830,000	$2,020,000	$142,000	$2,162,000
	BUR075	BLM Polygon	Upland tailings	C01	$14,700	$10,300	$25,000	$0	$25,000
				C07	$51,500	$36,000	$87,500	$11,300	$98,800
	BUR094	BLM Polygon	Upland waste rock (erosion potential)	C02a	$118,000	$82,600	$200,600	$15,300	$215,900
	BUR096	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				WT01	$4,890	$5,230	$10,120	$291	$10,411
			Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR097	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$869,000	$929,000	$1,798,000	$51,700	$1,849,700
			Upland waste rock	C02a	$73,300	$51,300	$124,600	$9,530	$134,130
	BUR098	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$905,000	$968,000	$1,873,000	$70,400	$1,943,400
			Upland waste rock (potential intermixed tailings)	C01	$231,000	$162,000	$393,000	$0	$393,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	BUR112	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
	BUR117	BLM Polygon	Upland tailings	C01	$7,560	$5,290	$12,850	$0	$12,850
				C07	$26,500	$18,500	$45,000	$5,820	$50,820
			Upland waste rock (potential intermixed tailings)	C03	$250,000	$175,000	$425,000	$30,000	$455,000
	BUR118	BLM Polygon	Upland waste rock (erosion potential)	C01	$139,000	$97,000	$236,000	$0	$236,000
				C07	$485,000	$340,000	$825,000	$107,000	$932,000
	BUR119	BLM Polygon	Upland waste rock	C02a	$175,000	$123,000	$298,000	$22,800	$320,800
	BUR120	BLM Polygon	Upland waste rock (erosion potential)	C02a	$78,400	$54,900	$133,300	$10,200	$143,500
	BUR121	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$682,000	$729,000	$1,411,000	$40,600	$1,451,600
			Upland waste rock (erosion potential)	C01	$86,500	$60,600	$147,100	$0	$147,100
				C03	$452,000	$317,000	$769,000	$54,300	$823,300
	BUR122	BLM Polygon	Upland waste rock (erosion potential)	C01	$22,700	$15,900	$38,600	$0	$38,600
				C03	$252,000	$176,000	$428,000	$30,200	$458,200
	BUR124	BLM Polygon	Upland waste rock (erosion potential)	C02a	$84,300	$59,000	$143,300	$11,000	$154,300
	BUR125	BLM Polygon	Upland waste rock (erosion potential)	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR128	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$199,000	$213,000	$412,000	$11,800	$423,800
			Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Upland tailings	C01	$182,000	$128,000	$310,000	$0	$310,000
				C07	$638,000	$447,000	$1,085,000	$140,000	$1,225,000
	BUR129	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland tailings	C01	$22,100	$15,400	$37,500	$0	$37,500
				C07	$77,200	$54,000	$131,200	$17,000	$148,200
	BUR141	BLM Polygon	Floodplain sediments	C01b	$290,000	$203,000	$493,000	$0	$493,000
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	BUR142	BLM Polygon	Upland tailings	C01	$10,300	$7,200	$17,500	$0	$17,500
				C07	$36,000	$25,200	$61,200	$7,920	$69,120
			Upland waste rock (potential intermixed tailings)	C03	$680,000	$476,000	$1,156,000	$81,500	$1,237,500
	BUR143	BLM Polygon	Floodplain sediments	C01b	$422,000	$296,000	$718,000	$0	$718,000

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Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C08a	$566,000	$396,000	$962,000	$79,300	$1,041,300
				HAUL-2	$176,000	$123,000	$299,000	$0	$299,000
	BUR144	BLM Polygon	Upland waste rock (erosion potential)	C01	$32,800	$22,900	$55,700	$0	$55,700
				C03	$572,000	$400,000	$972,000	$68,600	$1,040,600
	BUR176	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$126,000	$88,200	$214,200	$15,100	$229,300
	BUR177	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$153,000	$107,000	$260,000	$18,400	$278,400
	BUR178	BLM Polygon	Upland waste rock (erosion potential)	C01	$9,240	$6,470	$15,710	$0	$15,710
				C03	$104,000	$72,500	$176,500	$12,400	$188,900
	BUR189	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	BUR190	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$302,000	$323,000	$625,000	$12,900	$637,900
	BUR191	BLM Polygon	Upland waste rock	C02a	$131,000	$91,500	$222,500	$17,000	$239,500
	BUR192	BLM Polygon	Floodplain tailings (discrete site)	C01	$13,000	$9,110	$22,110	$0	$22,110
				C07	$45,600	$31,900	$77,500	$10,000	$87,500
			Upland waste rock (erosion potential)	C01	$22,700	$15,900	$38,600	$0	$38,600
				C03	$252,000	$176,000	$428,000	$30,200	$458,200
	BUR204	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$42,800	$29,900	$72,700	$5,130	$77,830
	CC04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$732,000	$512,000	$1,244,000	$220,000	$1,464,000
				CD-AVG	$371,000	$260,000	$631,000	$111,000	$742,000
				CD-SED	$37,400	$26,200	$63,600	$224,000	$287,600
				FP/RP-AVG	$510,000	$357,000	$867,000	$91,900	$958,900
				VBS-AVG	$520,000	$364,000	$884,000	$156,000	$1,040,000
	HHWPCC04-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPCC04-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPCC04-3	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
CCSeg05	CC05-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$81,400	$57,000	$138,400	$24,400	$162,800
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$916,000	$641,000	$1,557,000	$165,000	$1,722,000
				VBS-AVG	$57,800	$40,400	$98,200	$17,300	$115,500
	CC05-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$492,000	$344,000	$836,000	$148,000	$984,000
				CD-AVG	$124,000	$86,500	$210,500	$37,100	$247,600
				CD-SED	$13,100	$9,160	$22,260	$78,500	$100,760
				CH REAL-1	$3,780,000	$2,650,000	$6,430,000	$643,000	$7,073,000
				FP/RP-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$350,000	$245,000	$595,000	$105,000	$700,000
	OSB047	BLM Polygon	Floodplain sediments	C01b	$46,000	$32,200	$78,200	$0	$78,200
				C08a	$61,700	$43,200	$104,900	$8,640	$113,540

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				HAUL-2	$19,100	$13,400	$32,500	$0	$32,500
	WAL010	BLM Polygon	Floodplain sediments	C01b	$13,500	$9,420	$22,920	$0	$22,920
				C08a	$18,100	$12,600	$30,700	$2,530	$33,230
				HAUL-2	$5,600	$3,920	$9,520	$0	$9,520
	WAL011	BLM Polygon	Floodplain sediments	C01b	$29,000	$20,300	$49,300	$0	$49,300
				C08a	$38,900	$27,300	$66,200	$5,450	$71,650
				HAUL-2	$12,100	$8,450	$20,550	$0	$20,550
	WAL039	BLM Polygon	Upland tailings	C01	$52,500	$36,800	$89,300	$0	$89,300
				C08a	$221,000	$155,000	$376,000	$31,000	$407,000
				HAUL-2	$68,600	$48,000	$116,600	$0	$116,600
	WAL040	BLM Polygon	Floodplain sediments	C01b	$171,000	$120,000	$291,000	$0	$291,000
				C08a	$229,000	$161,000	$390,000	$32,100	$422,100
				HAUL-2	$71,200	$49,800	$121,000	$0	$121,000
	WAL041	BLM Polygon	Floodplain sediments	C01b	$52,300	$36,600	$88,900	$0	$88,900
				C08a	$70,200	$49,100	$119,300	$9,830	$129,130
				HAUL-2	$21,800	$15,200	$37,000	$0	$37,000
	WAL042	BLM Polygon	Floodplain tailings - inactive Facilities	C03	$579,000	$406,000	$985,000	$69,500	$1,054,500
	WAL081	BLM Polygon	Floodplain artificial fill	C01	$12,000	$8,380	$20,380	$0	$20,380
				C08a	$50,400	$35,300	$85,700	$7,060	$92,760
				HAUL-2	$15,600	$11,000	$26,600	$0	$26,600
	WP-OPTIONC	BLM Polygon	Floodplain sediments	C14b	$1,360,000	$954,000	$2,314,000	$54,500	$2,368,500
				C15b	$7,070,000	$4,950,000	$12,020,000	$141,000	$12,161,000
			Groundwater	WT01	$453,000	$485,000	$938,000	$41,000	$979,000
			Source General Information	PIPE-2	$388,000	$272,000	$660,000	$31,000	$691,000
MIDGradSeg	PIPEMG	General Feature	Source General Information	PIPE-1	$417,000	$292,000	$709,000	$33,300	$742,300
				PIPE-2	$40,400	$28,300	$68,700	$3,230	$71,930
				PIPE-4	$12,100,000	$8,480,000	$20,580,000	$969,000	$21,549,000
MIDGradSeg01	HHWPMG01-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-3	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-4	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPMG01-5	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	KLE011	BLM Polygon	Upland tailings - inactive facilities	C09	$1,940,000	$1,360,000	$3,300,000	$388,000	$3,688,000
	KLE016	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$140,000	$97,700	$237,700	$16,700	$254,400
	KLE020	BLM Polygon	Upland waste rock (erosion potential)	C01	$30,200	$21,200	$51,400	$0	$51,400
				C03	$333,000	$233,000	$566,000	$40,000	$606,000
	KLE021	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$146,000	$102,000	$248,000	$17,600	$265,600
	KLE023	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$259,000	$181,000	$440,000	$31,100	$471,100
	KLE033	BLM Polygon	Upland waste rock (erosion potential)	C01	$21,000	$14,700	$35,700	$0	$35,700

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C03	$360,000	$252,000	$612,000	$43,200	$655,200
	KLE034	BLM Polygon	Floodplain waste rock	C01	$18,500	$12,900	$31,400	$0	$31,400
				C03	$515,000	$361,000	$876,000	$61,800	$937,800
	KLE035	BLM Polygon	Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Floodplain waste rock	C01	$252,000	$176,000	$428,000	$0	$428,000
				C03	$3,030,000	$2,120,000	$5,150,000	$363,000	$5,513,000
	KLE040	BLM Polygon	Floodplain sediments	C14c	$10,400,000	$7,280,000	$17,680,000	$312,000	$17,992,000
				C15b	$3,170,000	$2,220,000	$5,390,000	$63,500	$5,453,500
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	KLE042	BLM Polygon	Floodplain sediments	C01b	$660,000	$462,000	$1,122,000	$0	$1,122,000
				C08a	$885,000	$620,000	$1,505,000	$124,000	$1,629,000
				HAUL-2	$275,000	$192,000	$467,000	$0	$467,000
			Floodplain tailings	C01	$54,600	$38,200	$92,800	$0	$92,800
				C07	$191,000	$134,000	$325,000	$42,000	$367,000
	KLE048	BLM Polygon	Floodplain sediments	C01b	$727,000	$509,000	$1,236,000	$0	$1,236,000
				C08a	$975,000	$683,000	$1,658,000	$137,000	$1,795,000
				C14c	$8,910,000	$6,240,000	$15,150,000	$267,000	$15,417,000
				C15b	$2,720,000	$1,900,000	$4,620,000	$54,400	$4,674,400
				HAUL-2	$302,000	$212,000	$514,000	$0	$514,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	KLE049	BLM Polygon	Floodplain sediments	C01b	$1,720,000	$1,200,000	$2,920,000	$0	$2,920,000
				C08a	$2,300,000	$1,610,000	$3,910,000	$322,000	$4,232,000
				C14c	$7,430,000	$5,200,000	$12,630,000	$223,000	$12,853,000
				C15b	$2,270,000	$1,590,000	$3,860,000	$45,400	$3,905,400
				HAUL-2	$714,000	$500,000	$1,214,000	$0	$1,214,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	KLE051	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$74,300	$52,000	$126,300	$8,910	$135,210
	KLE062	BLM Polygon	Floodplain sediments	C01b	$343,000	$240,000	$583,000	$0	$583,000
				C08a	$460,000	$322,000	$782,000	$64,400	$846,400
				HAUL-2	$143,000	$99,900	$242,900	$0	$242,900
	KLE066	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$85,500	$59,900	$145,400	$10,300	$155,700
	KLE067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$267,000	$187,000	$454,000	$1,010,000	$1,464,000
			Upland waste rock (erosion potential)	C01	$23,100	$16,200	$39,300	$0	$39,300
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	KLE068	BLM Polygon	Upland waste rock (erosion potential)	C01	$58,800	$41,200	$100,000	$0	$100,000
				C07	$206,000	$144,000	$350,000	$45,300	$395,300
	KLE069	BLM Polygon	Upland waste rock (erosion potential)	C01	$2,730	$1,910	$4,640	$0	$4,640
				C03	$94,500	$66,200	$160,700	$11,300	$172,000
	KLE070	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286

TABLE D-37
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C03	$94,500	$66,200	$160,700	$11,300	$172,000
	KLE074	BLM Polygon	Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Upland tailings	C01	$58,800	$41,200	$100,000	$0	$100,000
				C07	$206,000	$144,000	$350,000	$45,300	$395,300
	KLE075	BLM Polygon	Upland tailings	C01	$16,800	$11,800	$28,600	$0	$28,600
				C07	$58,800	$41,200	$100,000	$12,900	$112,900
	MG01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$110,000	$76,900	$186,900	$32,900	$219,800
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$46,800	$32,800	$79,600	$8,430	$88,030
	MG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$48,800	$34,200	$83,000	$14,600	$97,600
				CD-AVG	$8,240	$5,770	$14,010	$2,470	$16,480
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$68,700	$48,100	$116,800	$12,400	$129,200
				VBS-AVG	$20,800	$14,600	$35,400	$6,240	$41,640
	MG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$98,200	$238,200	$42,100	$280,300
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$384,000	$269,000	$653,000	$69,100	$722,100
				VBS-AVG	$59,800	$41,900	$101,700	$17,900	$119,600
	MG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$134,000	$93,900	$227,900	$40,300	$268,200
				CD-AVG	$26,800	$18,700	$45,500	$8,030	$53,530
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$554,000	$388,000	$942,000	$99,700	$1,041,700
				OFFCH-AVG	$2,320,000	$1,620,000	$3,940,000	$417,000	$4,357,000
				VBS-AVG	$57,200	$40,000	$97,200	$17,200	$114,400
	MG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$43,300	$30,300	$73,600	$13,000	$86,600
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				CH REAL-1	$1,270,000	$892,000	$2,162,000	$217,000	$2,379,000
				FP/RP-AVG	$342,000	$239,000	$581,000	$61,500	$642,500
				OFFCH-AVG	$3,570,000	$2,500,000	$6,070,000	$642,000	$6,712,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$92,500	$64,700	$157,200	$27,700	$184,900
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				CH REAL-1	$426,000	$298,000	$724,000	$72,500	$796,500
				FP/RP-AVG	$203,000	$142,000	$345,000	$36,600	$381,600
				OFFCH-AVG	$179,000	$125,000	$304,000	$32,300	$336,300
				VBS-AVG	$39,400	$27,600	$67,000	$11,800	$78,800
	MG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$47,100	$33,000	$80,100	$14,100	$94,200
				CD-AVG	$35,000	$24,500	$59,500	$10,500	$70,000

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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$51,800	$36,200	$88,000	$9,320	$97,320
				OFFCH-AVG	$2,650,000	$1,850,000	$4,500,000	$476,000	$4,976,000
				VBS-AVG	$20,100	$14,100	$34,200	$6,020	$40,220
	MG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$13,100	$9,140	$22,240	$3,920	$26,160
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$19,400	$13,600	$33,000	$3,500	$36,500
				OFFCH-AVG	$444,000	$311,000	$755,000	$80,000	$835,000
				VBS-AVG	$5,560	$3,890	$9,450	$1,670	$11,120
	MG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$334,000	$234,000	$568,000	$100,000	$668,000
				CD-AVG	$49,400	$34,600	$84,000	$14,800	$98,800
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				CH REAL-1	$1,540,000	$1,080,000	$2,620,000	$262,000	$2,882,000
				FP/RP-AVG	$523,000	$366,000	$889,000	$94,100	$983,100
				OFFCH-AVG	$659,000	$462,000	$1,121,000	$119,000	$1,240,000
				VBS-AVG	$142,000	$99,700	$241,700	$42,700	$284,400
	MG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$167,000	$117,000	$284,000	$50,000	$334,000
				CD-AVG	$24,700	$17,300	$42,000	$7,420	$49,420
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				CH REAL-1	$768,000	$538,000	$1,306,000	$131,000	$1,437,000
				FP/RP-AVG	$537,000	$376,000	$913,000	$96,600	$1,009,600
				OFFCH-AVG	$231,000	$162,000	$393,000	$41,500	$434,500
				VBS-AVG	$71,000	$49,700	$120,700	$21,300	$142,000
	MG01-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$28,800	$20,200	$49,000	$8,650	$57,650
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$131,000	$91,500	$222,500	$23,500	$246,000
	MG01-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$134,000	$93,900	$227,900	$40,300	$268,200
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$199,000	$140,000	$339,000	$35,900	$374,900
				VBS-AVG	$57,200	$40,000	$97,200	$17,200	$114,400
	MG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$1,560,000	$1,100,000	$2,660,000	$282,000	$2,942,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$12,400	$8,650	$21,050	$3,710	$24,760
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$35,000	$24,500	$59,500	$6,310	$65,810

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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				VBS-AVG	$41,600	$29,100	$70,700	$12,500	$83,200
	MG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$384,000	$269,000	$653,000	$115,000	$768,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$518,000	$363,000	$881,000	$93,300	$974,300
				OFFCH-AVG	$956,000	$669,000	$1,625,000	$172,000	$1,797,000
				VBS-AVG	$164,000	$115,000	$279,000	$49,100	$328,100
	MG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$433,000	$303,000	$736,000	$130,000	$866,000
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				FP/RP-AVG	$443,000	$310,000	$753,000	$79,700	$832,700
				OFFCH-AVG	$998,000	$699,000	$1,697,000	$180,000	$1,877,000
				VBS-AVG	$185,000	$129,000	$314,000	$55,400	$369,400
	MG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$286,000	$200,000	$486,000	$85,900	$571,900
				CD-AVG	$43,300	$30,300	$73,600	$13,000	$86,600
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				CH REAL-1	$1,320,000	$924,000	$2,244,000	$225,000	$2,469,000
				FP/RP-AVG	$17,900	$12,600	$30,500	$3,230	$33,730
				OFFCH-AVG	$3,640,000	$2,550,000	$6,190,000	$655,000	$6,845,000
				VBS-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
	MG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$68,000	$47,600	$115,600	$20,400	$136,000
				CD-AVG	$10,300	$7,210	$17,510	$3,090	$20,600
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				CH REAL-1	$314,000	$219,000	$533,000	$53,300	$586,300
				FP/RP-AVG	$305,000	$214,000	$519,000	$55,000	$574,000
				VBS-AVG	$29,000	$20,300	$49,300	$8,690	$57,990
	MUL085	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C04	$94,000	$65,800	$159,800	$21,600	$181,400
	MUL086	BLM Polygon	Upland waste rock (erosion potential)	C01	$25,200	$17,600	$42,800	$0	$42,800
				C03	$284,000	$198,000	$482,000	$34,000	$516,000
	OSB025	BLM Polygon	Upland waste rock (erosion potential)	C01	$10,100	$7,060	$17,160	$0	$17,160
				C03	$113,000	$78,800	$191,800	$13,500	$205,300
	OSB030	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$101,000	$70,900	$171,900	$12,200	$184,100
	OSB065	BLM Polygon	Floodplain sediments	C01b	$5,730,000	$4,010,000	$9,740,000	$0	$9,740,000
				C08a	$7,680,000	$5,380,000	$13,060,000	$1,080,000	$14,140,000
				C14c	$65,300,000	$45,700,000	$111,000,000	$1,960,000	$112,960,000
				C15b	$20,000,000	$14,000,000	$34,000,000	$399,000	$34,399,000
				HAUL-2	$2,380,000	$1,670,000	$4,050,000	$0	$4,050,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	OSB070	BLM Polygon	Upland waste rock (erosion potential)	C01	$26,000	$18,200	$44,200	$0	$44,200
				C03	$293,000	$205,000	$498,000	$35,100	$533,100

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	OSB072	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$51,800	$36,200	$88,000	$6,210	$94,210
	OSB073	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,500	$12,900	$31,400	$0	$31,400
				C03	$131,000	$91,400	$222,400	$15,700	$238,100
	OSB074	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	OSB075	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$63,000	$44,100	$107,100	$7,560	$114,660
	OSB076	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	OSB078	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$18,000	$12,600	$30,600	$2,160	$32,760
	OSB117	BLM Polygon	Floodplain tailings	C01	$58,800	$41,200	$100,000	$0	$100,000
				C07	$206,000	$144,000	$350,000	$45,300	$395,300
	OSB118	BLM Polygon	Floodplain sediments	C01b	$792,000	$554,000	$1,346,000	$0	$1,346,000
				C08a	$1,060,000	$743,000	$1,803,000	$149,000	$1,952,000
				HAUL-2	$329,000	$231,000	$560,000	$0	$560,000
	OSB119	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$11,100,000	$7,790,000	$18,890,000	$223,000	$19,113,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$1,800	$64,300
	OSB120	BLM Polygon	Floodplain sediments	C01b	$3,800,000	$2,660,000	$6,460,000	$0	$6,460,000
				C08a	$5,100,000	$3,570,000	$8,670,000	$714,000	$9,384,000
				C14c	$41,600,000	$29,100,000	$70,700,000	$1,250,000	$71,950,000
				C15b	$12,700,000	$8,890,000	$21,590,000	$254,000	$21,844,000
				HAUL-2	$1,580,000	$1,110,000	$2,690,000	$0	$2,690,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	POL018	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,500	$12,900	$31,400	$0	$31,400
				C03	$205,000	$143,000	$348,000	$24,600	$372,600
	POL019	BLM Polygon	Upland waste rock (erosion potential)	C05	$1,880,000	$1,320,000	$3,200,000	$434,000	$3,634,000
	POL021	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$149,000	$104,000	$253,000	$17,800	$270,800
	POL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$45,000	$31,500	$76,500	$5,400	$81,900
	WAL001	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$13,400,000	$9,350,000	$22,750,000	$267,000	$23,017,000
			Groundwater	WT01	$60,300	$64,500	$124,800	$1,440	$126,240
			Upland tailings - active facilities	C09	$16,300,000	$11,400,000	$27,700,000	$3,260,000	$30,960,000
	WAL002	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$603	$645	$1,248	$29	$1,277
			Floodplain waste rock	C01	$168	$118	$286	$0	$286
				C03	$196,000	$137,000	$333,000	$23,500	$356,500
	WAL004	BLM Polygon	Floodplain sediments	C01b	$1,440,000	$1,010,000	$2,450,000	$0	$2,450,000
				C08a	$1,930,000	$1,350,000	$3,280,000	$270,000	$3,550,000
				C14c	$25,200,000	$17,700,000	$42,900,000	$757,000	$43,657,000

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C15b	$7,710,000	$5,400,000	$13,110,000	$154,000	$13,264,000
				HAUL-2	$597,000	$418,000	$1,015,000	$0	$1,015,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	WAL014	BLM Polygon	Upland waste rock (erosion potential)	C01	$32,800	$22,900	$55,700	$0	$55,700
				C03	$362,000	$254,000	$616,000	$43,500	$659,500
	WAL016	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	WAL020	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C01	$292,000	$204,000	$496,000	$0	$496,000
				C03	$1,310,000	$914,000	$2,224,000	$157,000	$2,381,000
	WAL024	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$96,800	$67,700	$164,500	$11,600	$176,100
	WAL034	BLM Polygon	Floodplain sediments	C01b	$515,000	$360,000	$875,000	$0	$875,000
				C08a	$690,000	$483,000	$1,173,000	$96,600	$1,269,600
				HAUL-2	$214,000	$150,000	$364,000	$0	$364,000
	WAL035	BLM Polygon	Floodplain waste rock	C01	$118,000	$82,300	$200,300	$0	$200,300
				C03	$1,330,000	$928,000	$2,258,000	$159,000	$2,417,000
	WAL036	BLM Polygon	Floodplain sediments	C01b	$297,000	$208,000	$505,000	$0	$505,000
				C07	$331,000	$232,000	$563,000	$72,800	$635,800
	WAL037	BLM Polygon	Upland tailings	C01	$50,400	$35,300	$85,700	$0	$85,700
				C07	$176,000	$123,000	$299,000	$38,800	$337,800
	WAL046	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$58,500	$41,000	$99,500	$7,020	$106,520
	WAL055	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$38,300	$26,800	$65,100	$4,590	$69,690
	WAL056	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$54,000	$37,800	$91,800	$6,480	$98,280
	WAL057	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$22,500	$15,800	$38,300	$2,700	$41,000
	WAL058	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$20,300	$14,200	$34,500	$2,430	$36,930
	WAL062	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$42,800	$29,900	$72,700	$5,130	$77,830
	WAL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$78,800	$55,100	$133,900	$9,450	$143,350
	WAL072	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$18,000	$12,600	$30,600	$2,160	$32,760
	WAL073	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$22,500	$15,800	$38,300	$2,700	$41,000
MIDGradSeg02	KLW061	BLM Polygon	Upland waste rock	C02b	$2,320,000	$1,620,000	$3,940,000	$301,000	$4,241,000
	KLW062	BLM Polygon	Upland waste rock	C02b	$356,000	$249,000	$605,000	$46,200	$651,200

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	KLW070	BLM Polygon	Floodplain sediments	C01b	$123,000	$86,400	$209,400	$0	$209,400
				C08a	$165,000	$116,000	$281,000	$23,200	$304,200
				HAUL-2	$51,300	$35,900	$87,200	$0	$87,200
	KLW095	BLM Polygon	Upland waste rock	C02b	$137,000	$95,900	$232,900	$17,800	$250,700
	MG02-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$7,540	$5,270	$12,810	$2,260	$15,070
				CD-AVG	$22,700	$15,900	$38,600	$6,800	$45,400
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				VBS-AVG	$6,420	$4,500	$10,920	$1,930	$12,850
	MG02-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$6,660	$4,660	$11,320	$2,000	$13,320
				CD-AVG	$8,240	$5,770	$14,010	$2,470	$16,480
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				VBS-AVG	$5,680	$3,980	$9,660	$1,700	$11,360
	MG02-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$1,830	$1,280	$3,110	$549	$3,659
				CD-AVG	$2,060	$1,440	$3,500	$618	$4,118
				FP/RP-AVG	$2,070	$1,450	$3,520	$372	$3,892
				VBS-AVG	$401	$281	$682	$120	$802
MoonCrkSeg01	KLE061	BLM Polygon	Floodplain waste rock	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MC01-2	Bioengineering Reach	BioReach Current Deflector Frequency	CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
			BioReach General Characteristics	BSBR-AVG	$187,000	$131,000	$318,000	$56,000	$374,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				FP/RP-AVG	$154,000	$108,000	$262,000	$27,700	$289,700
				VBS-AVG	$79,600	$55,700	$135,300	$23,900	$159,200
MoonCrkSeg02	KLE008	BLM Polygon	Upland waste rock (erosion potential)	C02b	$109,000	$76,000	$185,000	$14,100	$199,100
	KLE014	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE041	BLM Polygon	Floodplain sediments	C01b	$43,600	$30,500	$74,100	$0	$74,100
				C08a	$58,400	$40,900	$99,300	$8,180	$107,480
				HAUL-2	$18,100	$12,700	$30,800	$0	$30,800
	KLE063	BLM Polygon	Upland waste rock (erosion potential)	C02b	$25,100	$17,500	$42,600	$3,260	$45,860
	KLE064	BLM Polygon	Upland waste rock (erosion potential)	C02b	$21,700	$15,200	$36,900	$2,820	$39,720
	KLE065	BLM Polygon	Upland waste rock (erosion potential)	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MC02-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$163,000	$114,000	$277,000	$48,800	$325,800
				CD-AVG	$124,000	$86,500	$210,500	$37,100	$247,600
				CD-SED	$13,100	$9,160	$22,260	$78,500	$100,760
				FP/RP-AVG	$447,000	$313,000	$760,000	$80,500	$840,500
				VBS-AVG	$69,400	$48,600	$118,000	$20,800	$138,800
	MC02-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$136,000	$95,400	$231,400	$40,900	$272,300
				CD-AVG	$51,500	$36,100	$87,600	$15,500	$103,100
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240

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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				FP/RP-AVG	$225,000	$157,000	$382,000	$40,400	$422,400
				VBS-AVG	$58,100	$40,700	$98,800	$17,400	$116,200
	MC02-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$70,800	$49,500	$120,300	$21,200	$141,500
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900
				VBS-AVG	$45,200	$31,600	$76,800	$13,600	$90,400
NMSeg	PIPENM	General Feature	Source General Information	PIPE-1	$1,560,000	$1,090,000	$2,650,000	$125,000	$2,775,000
NMSeg01	BUR051	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	BUR052	BLM Polygon	Upland waste rock	C01	$3,360	$2,350	$5,710	$0	$5,710
				C03	$36,000	$25,200	$61,200	$4,320	$65,520
	BUR053	BLM Polygon	Upland waste rock (erosion potential)	C01	$2,910,000	$2,030,000	$4,940,000	$0	$4,940,000
				C04	$2,150,000	$1,500,000	$3,650,000	$494,000	$4,144,000
	BUR140	BLM Polygon	Floodplain sediments	C01b	$132,000	$92,400	$224,400	$0	$224,400
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
	BUR160	BLM Polygon	Upland waste rock (erosion potential)	C04	$1,070,000	$747,000	$1,817,000	$245,000	$2,062,000
	NM01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$489,000	$343,000	$832,000	$147,000	$979,000
				CD-AVG	$98,900	$69,200	$168,100	$29,700	$197,800
				CD-SED	$9,350	$6,550	$15,900	$56,100	$72,000
				FP/RP-AVG	$269,000	$188,000	$457,000	$48,400	$505,400
				VBS-AVG	$209,000	$146,000	$355,000	$62,600	$417,600
NMSeg02	BUR054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$211,000	$148,000	$359,000	$549,000	$908,000
			Upland tailings - inactive facilities	C09	$615,000	$431,000	$1,046,000	$123,000	$1,169,000
			Upland waste rock (potential intermixed tailings)	C03	$4,820,000	$3,370,000	$8,190,000	$578,000	$8,768,000
	BUR055	BLM Polygon	Floodplain sediments	C01b	$72,600	$50,800	$123,400	$0	$123,400
				C08a	$97,400	$68,100	$165,500	$13,600	$179,100
				HAUL-2	$30,200	$21,100	$51,300	$0	$51,300
			Upland tailings	C01	$58,800	$41,200	$100,000	$0	$100,000
				C07	$206,000	$144,000	$350,000	$45,300	$395,300
	BUR056	BLM Polygon	Upland waste rock (potential intermixed tailings)	C02b	$2,230,000	$1,560,000	$3,790,000	$290,000	$4,080,000
	BUR058	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	BUR139	BLM Polygon	Upland waste rock	C03	$295,000	$206,000	$501,000	$35,400	$536,400
	BUR170	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$453,000	$317,000	$770,000	$1,160,000	$1,930,000
			Upland waste rock (potential intermixed tailings)	C03	$214,000	$150,000	$364,000	$25,700	$389,700
	BUR171	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$330,000	$231,000	$561,000	$1,060,000	$1,621,000
			Upland waste rock (potential intermixed tailings)	C03	$149,000	$104,000	$253,000	$17,800	$270,800

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	BUR172	BLM Polygon	Upland waste rock	C03	$96,800	$67,700	$164,500	$11,600	$176,100
	NM02-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$921,000	$645,000	$1,566,000	$276,000	$1,842,000
				CD-AVG	$185,000	$130,000	$315,000	$55,600	$370,600
				CD-SED	$18,700	$13,100	$31,800	$112,000	$143,800
				FP/RP-AVG	$506,000	$354,000	$860,000	$91,100	$951,100
				OFFCH-AVG	$14,800	$10,300	$25,100	$2,660	$27,760
				VBS-AVG	$393,000	$275,000	$668,000	$118,000	$786,000
	OSB040	BLM Polygon	Floodplain sediments	C01b	$223,000	$156,000	$379,000	$0	$379,000
				C08a	$299,000	$210,000	$509,000	$41,900	$550,900
				HAUL-2	$92,800	$65,000	$157,800	$0	$157,800
	OSB044	BLM Polygon	Floodplain sediments	C01b	$132,000	$92,400	$224,400	$0	$224,400
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
			Upland tailings (jig tailings)	C01	$1,510,000	$1,060,000	$2,570,000	$0	$2,570,000
				C08a	$6,370,000	$4,460,000	$10,830,000	$892,000	$11,722,000
				HAUL-2	$1,980,000	$1,380,000	$3,360,000	$0	$3,360,000
			Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	OSB048	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	OSB056	BLM Polygon	Floodplain sediments	C01b	$21,100	$14,800	$35,900	$0	$35,900
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB057	BLM Polygon	Floodplain sediments	C01b	$172,000	$120,000	$292,000	$0	$292,000
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	OSB058	BLM Polygon	Floodplain sediments	C01b	$21,100	$14,800	$35,900	$0	$35,900
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$3,920	$4,200	$8,120	$233	$8,353
	OSB089	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$10,600	$11,300	$21,900	$682	$22,582
NMSeg03	NM03-1	Bioengineering Reach	BioReach General Characteristics	CD-AVG	$68,000	$47,600	$115,600	$20,400	$136,000
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$621,000	$434,000	$1,055,000	$112,000	$1,167,000
				OFFCH-AVG	$56,000	$39,200	$95,200	$10,100	$105,300
				VBS-AVG	$169,000	$118,000	$287,000	$50,600	$337,600
NMSeg04	NM04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$252,000	$177,000	$429,000	$75,700	$504,700
	NM04-1	Bioengineering Reach	BioReach General Characteristics	CD-AVG	$51,500	$36,100	$87,600	$15,500	$103,100
	NM04-1	Bioengineering Reach	BioReach General Characteristics	CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				CH REAL-1	$1,160,000	$815,000	$1,975,000	$198,000	$2,173,000
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900
				OFFCH-AVG	$84,000	$58,800	$142,800	$15,100	$157,900

TABLE D-37
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				VBS-AVG	$108,000	$75,300	$183,300	$32,300	$215,600
	NM04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$87,500	$61,200	$148,700	$26,200	$174,900
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				CD-SED	$1,870	$1,310	$3,180	$11,200	$14,380
				CH REAL-1	$404,000	$282,000	$686,000	$68,600	$754,600
				FP/RP-AVG	$192,000	$135,000	$327,000	$34,600	$361,600
				VBS-AVG	$37,300	$26,100	$63,400	$11,200	$74,600
	NM04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$677,000	$474,000	$1,151,000	$203,000	$1,354,000
				CD-AVG	$138,000	$96,600	$234,600	$41,400	$276,000
				CD-SED	$13,100	$9,160	$22,260	$78,500	$100,760
				CH REAL-1	$3,120,000	$2,190,000	$5,310,000	$531,000	$5,841,000
				FP/RP-AVG	$893,000	$625,000	$1,518,000	$161,000	$1,679,000
				VBS-AVG	$289,000	$202,000	$491,000	$86,600	$577,600
	OSB032	BLM Polygon	Floodplain waste rock	C01	$16,800	$11,800	$28,600	$0	$28,600
				C03	$189,000	$132,000	$321,000	$22,700	$343,700
	OSB033	BLM Polygon	Upland waste rock (erosion potential)	C01	$13,400	$9,410	$22,810	$0	$22,810
				C03	$153,000	$107,000	$260,000	$18,400	$278,400
	OSB038	BLM Polygon	Floodplain waste rock	C01	$26,000	$18,200	$44,200	$0	$44,200
				C03	$288,000	$202,000	$490,000	$34,600	$524,600
	OSB039	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,100	$4,390	$8,490	$244	$8,734
			Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Floodplain sediments	C01b	$145,000	$102,000	$247,000	$0	$247,000
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
			Upland tailings	C01	$46,200	$32,300	$78,500	$0	$78,500
				C07	$162,000	$113,000	$275,000	$35,600	$310,600
	OSB052	BLM Polygon	Upland tailings - inactive facilities	C09	$1,370,000	$956,000	$2,326,000	$273,000	$2,599,000
	OSB059	BLM Polygon	Floodplain sediments	C01b	$436,000	$305,000	$741,000	$0	$741,000
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	OSB060	BLM Polygon	Floodplain sediments	C01b	$10,600	$7,390	$17,990	$0	$17,990
				C07	$11,800	$8,230	$20,030	$2,590	$22,620
	OSB061	BLM Polygon	Upland tailings	C01	$29,400	$20,600	$50,000	$0	$50,000
				C07	$103,000	$72,000	$175,000	$22,600	$197,600
	OSB082	BLM Polygon	Floodplain waste rock	C01	$10,900	$7,640	$18,540	$0	$18,540
				C03	$122,000	$85,100	$207,100	$14,600	$221,700
	OSB115	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$76,500	$53,600	$130,100	$9,180	$139,280
	WAL006	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$56,300	$39,400	$95,700	$6,750	$102,450
	WAL033	BLM Polygon	Floodplain sediments	C01b	$435,000	$305,000	$740,000	$0	$740,000

TABLE D-37
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C07	$485,000	$339,000	$824,000	$107,000	$931,000
PineCrkSeg01	HHWPPC01-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPPC01-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	MAS006	BLM Polygon	Floodplain tailings - inactive Facilities	C09	$1,010,000	$706,000	$1,716,000	$202,000	$1,918,000
				C11j	$3,180,000	$2,230,000	$5,410,000	$63,600	$5,473,600
	MAS007	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$346,000	$242,000	$588,000	$1,100,000	$1,688,000
			Upland waste rock	C01	$202,000	$141,000	$343,000	$0	$343,000
				C03	$410,000	$287,000	$697,000	$49,100	$746,100
	MAS008	BLM Polygon	Upland waste rock (erosion potential)	C01	$105,000	$73,500	$178,500	$0	$178,500
				C07	$368,000	$257,000	$625,000	$80,900	$705,900
	MAS009	BLM Polygon	Upland waste rock (erosion potential)	C01	$31,200	$21,900	$53,100	$0	$53,100
				C07	$109,000	$76,600	$185,600	$24,100	$209,700
	MAS011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$136,000	$95,300	$231,300	$527,000	$758,300
	MAS012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$2,100	$1,470	$3,570	$0	$3,570
				C07	$7,350	$5,150	$12,500	$1,620	$14,120
	MAS013	BLM Polygon	Upland waste rock (erosion potential)	C01	$19,700	$13,800	$33,500	$0	$33,500
				C07	$69,100	$48,400	$117,500	$15,200	$132,700
	MAS014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Seep	WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland tailings	C01	$336	$235	$571	$0	$571
				C08a	$1,420	$991	$2,411	$198	$2,609
				HAUL-2	$439	$307	$746	$0	$746
	MAS015	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$267,000	$187,000	$454,000	$1,000,000	$1,454,000
			Upland waste rock (erosion potential)	C01	$4,200	$2,940	$7,140	$0	$7,140
				C07	$14,700	$10,300	$25,000	$3,230	$28,230
	MAS016	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$135,000	$94,400	$229,400	$527,000	$756,400
			Upland waste rock (erosion potential)	C01	$97,800	$68,400	$166,200	$0	$166,200
				C07	$342,000	$240,000	$582,000	$75,300	$657,300
	MAS017	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$263,000	$184,000	$447,000	$0	$447,000
				C07	$921,000	$645,000	$1,566,000	$203,000	$1,769,000
	MAS018	BLM Polygon	Upland waste rock (erosion potential)	C01	$11,300	$7,940	$19,240	$0	$19,240
				C07	$39,700	$27,800	$67,500	$8,730	$76,230
	MAS019	BLM Polygon	Floodplain waste rock	C01	$4,200	$2,940	$7,140	$0	$7,140

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				C07	$14,700	$10,300	$25,000	$3,230	$28,230
	MAS020	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$363,000	$254,000	$617,000	$1,030,000	$1,647,000
	MAS021	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$389,000	$272,000	$661,000	$1,140,000	$1,801,000
			Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C04	$160,000	$112,000	$272,000	$36,800	$308,800
	MAS022	BLM Polygon	Floodplain waste rock	C01	$202,000	$141,000	$343,000	$0	$343,000
				C07	$706,000	$494,000	$1,200,000	$155,000	$1,355,000
	MAS023	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,200	$2,940	$7,140	$0	$7,140
				C07	$14,700	$10,300	$25,000	$3,230	$28,230
	MAS027	BLM Polygon	Floodplain waste rock	C01	$29,400	$20,600	$50,000	$0	$50,000
				C03	$545,000	$381,000	$926,000	$65,300	$991,300
	MAS028	BLM Polygon	Upland waste rock (erosion potential)	C01	$45,400	$31,800	$77,200	$0	$77,200
				C07	$159,000	$111,000	$270,000	$34,900	$304,900
	MAS029	BLM Polygon	Upland waste rock (intermixed tailings)	C01	$2,940	$2,060	$5,000	$0	$5,000
				C07	$10,300	$7,200	$17,500	$2,260	$19,760
	MAS030	BLM Polygon	Upland waste rock (erosion potential)	C01	$5,640	$3,950	$9,590	$0	$9,590
				C03	$63,000	$44,100	$107,100	$7,560	$114,660
	MAS031	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,100	$12,700	$30,800	$0	$30,800
				C07	$63,500	$44,500	$108,000	$14,000	$122,000
	MAS032	BLM Polygon	Upland waste rock (erosion potential)	C01	$336	$235	$571	$0	$571
				C07	$1,180	$823	$2,003	$259	$2,262
	MAS033	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,200	$14,100	$34,300	$0	$34,300
				C07	$70,600	$49,400	$120,000	$15,500	$135,500
	MAS035	BLM Polygon	Upland waste rock (erosion potential)	C01	$33,600	$23,500	$57,100	$0	$57,100
				C07	$118,000	$82,300	$200,300	$25,900	$226,200
	MAS036	BLM Polygon	Floodplain tailings	C01	$11,300	$7,940	$19,240	$0	$19,240
				C07	$39,700	$27,800	$67,500	$8,730	$76,230
	MAS040	BLM Polygon	Floodplain sediments	C01b	$18,200	$12,800	$31,000	$0	$31,000
				C08a	$24,400	$17,100	$41,500	$3,420	$44,920
				HAUL-2	$7,580	$5,300	$12,880	$0	$12,880
	MAS041	BLM Polygon	Floodplain sediments	C01b	$30,900	$21,600	$52,500	$0	$52,500
				C08a	$41,400	$29,000	$70,400	$5,800	$76,200
				HAUL-2	$12,800	$8,990	$21,790	$0	$21,790
	MAS042	BLM Polygon	Floodplain sediments	C01b	$14,300	$9,980	$24,280	$0	$24,280
				C08a	$19,100	$13,400	$32,500	$2,680	$35,180
				HAUL-2	$5,930	$4,150	$10,080	$0	$10,080
	MAS043	BLM Polygon	Floodplain sediments	C01b	$39,600	$27,700	$67,300	$0	$67,300
				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000
	MAS045	BLM Polygon	Floodplain sediments	C01b	$39,600	$27,700	$67,300	$0	$67,300

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				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000
	MAS046	BLM Polygon	Floodplain sediments	C01b	$315,000	$220,000	$535,000	$0	$535,000
				C08a	$422,000	$296,000	$718,000	$59,100	$777,100
				HAUL-2	$131,000	$91,700	$222,700	$0	$222,700
	MAS048	BLM Polygon	Floodplain tailings	C01	$20,800	$14,600	$35,400	$0	$35,400
				C07	$72,800	$50,900	$123,700	$16,000	$139,700
			Upland tailings	C01	$68,500	$48,000	$116,500	$0	$116,500
				C07	$240,000	$168,000	$408,000	$52,800	$460,800
	MAS049	BLM Polygon	Floodplain tailings	C01	$151,000	$106,000	$257,000	$0	$257,000
				C07	$529,000	$370,000	$899,000	$116,000	$1,015,000
	MAS050	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$374,000	$261,000	$635,000	$1,150,000	$1,785,000
			Floodplain waste rock (intermixed tailings)	C01	$89,900	$62,900	$152,800	$0	$152,800
				C03	$338,000	$236,000	$574,000	$40,500	$614,500
	MAS052	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,440	$3,100	$7,540	$0	$7,540
				C03	$49,500	$34,700	$84,200	$5,940	$90,140
	MAS053	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$184,000	$129,000	$313,000	$538,000	$851,000
			Floodplain waste rock	C01	$44,400	$31,000	$75,400	$0	$75,400
				C07	$155,000	$109,000	$264,000	$34,200	$298,200
	MAS055	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS057	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS065	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS068	BLM Polygon	Upland waste rock (erosion potential)	C01	$168	$118	$286	$0	$286
				C03	$36,000	$25,200	$61,200	$4,320	$65,520
	MAS072	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MAS078	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$354,000	$247,000	$601,000	$578,000	$1,179,000
	MAS079	BLM Polygon	Floodplain waste rock	C01	$157,000	$110,000	$267,000	$0	$267,000
				C03	$428,000	$299,000	$727,000	$51,300	$778,300
	MAS083	BLM Polygon	Upland tailings	C01	$34,200	$24,000	$58,200	$0	$58,200
				C07	$120,000	$83,900	$203,900	$26,400	$230,300
			Upland waste rock	C01	$122,000	$85,300	$207,300	$0	$207,300
				C03	$632,000	$443,000	$1,075,000	$75,900	$1,150,900
	MAS084	BLM Polygon	Floodplain tailings	C01	$126,000	$88,200	$214,200	$0	$214,200

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C07	$441,000	$309,000	$750,000	$97,000	$847,000
PineCrkSeg02	TWI002	BLM Polygon	Floodplain waste rock	C01	$24,200	$16,900	$41,100	$0	$41,100
				C07	$84,700	$59,300	$144,000	$18,600	$162,600
	TWI006	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,200	$14,100	$34,300	$0	$34,300
				C07	$70,600	$49,400	$120,000	$15,500	$135,500
	TWI008	BLM Polygon	Floodplain waste rock	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI009	BLM Polygon	Floodplain waste rock	C01	$27,200	$19,100	$46,300	$0	$46,300
				C07	$95,300	$66,700	$162,000	$21,000	$183,000
	TWI011	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI012	BLM Polygon	Floodplain waste rock	C01	$16,100	$11,300	$27,400	$0	$27,400
				C07	$56,400	$39,500	$95,900	$12,400	$108,300
	TWI013	BLM Polygon	Upland waste rock	C01	$32,300	$22,600	$54,900	$0	$54,900
				C07	$113,000	$79,000	$192,000	$24,800	$216,800
	TWI014	BLM Polygon	Floodplain waste rock	C01	$25,200	$17,600	$42,800	$0	$42,800
				C07	$88,200	$61,700	$149,900	$19,400	$169,300
	TWI018	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI020	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI027	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI029	BLM Polygon	Upland waste rock	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	TWI030	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
PineCrkSeg03	KLW075	BLM Polygon	Floodplain waste rock	C01	$71,600	$50,100	$121,700	$0	$121,700
				C07	$250,000	$175,000	$425,000	$55,100	$480,100
	KLW077	BLM Polygon	Floodplain waste rock	C01	$46,400	$32,500	$78,900	$0	$78,900
				C07	$162,000	$114,000	$276,000	$35,700	$311,700
	KLW079	BLM Polygon	Floodplain waste rock	C01	$40,300	$28,200	$68,500	$0	$68,500
				C07	$141,000	$98,800	$239,800	$31,000	$270,800
	KLW082	BLM Polygon	Floodplain waste rock	C01	$34,300	$24,000	$58,300	$0	$58,300
				C07	$120,000	$84,000	$204,000	$26,400	$230,400
	KLW083	BLM Polygon	Floodplain waste rock	C01	$58,500	$40,900	$99,400	$0	$99,400
				C07	$205,000	$143,000	$348,000	$45,000	$393,000
	KLW085	BLM Polygon	Floodplain waste rock	C01	$60,500	$42,300	$102,800	$0	$102,800
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	MAS003	BLM Polygon	Upland waste rock (intermixed tailings)	C04	$980,000	$686,000	$1,666,000	$226,000	$1,892,000
	PC03-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$248,000	$174,000	$422,000	$74,400	$496,400
				CD-AVG	$76,200	$53,400	$129,600	$22,900	$152,500

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$312,000	$218,000	$530,000	$56,100	$586,100
				OFFCH-AVG	$790,000	$553,000	$1,343,000	$142,000	$1,485,000
				VBS-AVG	$106,000	$74,000	$180,000	$31,700	$211,700
	PC03-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$201,000	$141,000	$342,000	$60,400	$402,400
				CD-AVG	$41,200	$28,800	$70,000	$12,400	$82,400
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$243,000	$170,000	$413,000	$43,700	$456,700
				OFFCH-AVG	$763,000	$534,000	$1,297,000	$137,000	$1,434,000
				VBS-AVG	$85,700	$60,000	$145,700	$25,700	$171,400
	PC03-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				CD-SED	$3,740	$2,620	$6,360	$22,400	$28,760
				FP/RP-AVG	$381,000	$267,000	$648,000	$68,600	$716,600
				VBS-AVG	$52,000	$36,400	$88,400	$15,600	$104,000
UpperSFCDRSeg	PIPEUG	General Feature	Source General Information	PIPE-1	$245,000	$172,000	$417,000	$19,600	$436,600
				PIPE-2	$12,900	$9,050	$21,950	$1,030	$22,980
				PIPE-3	$6,420,000	$4,490,000	$10,910,000	$513,000	$11,423,000
				PIPE-4	$5,080,000	$3,560,000	$8,640,000	$406,000	$9,046,000
UpperSFCDRSeg01	HHWPUG01-1	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-2	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-3	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-4	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	HHWPUG01-5	General Feature	Upland waste rock	HH-2	$58,400	$40,900	$99,300	$7,600	$106,900
	LOK001	BLM Polygon	Upland waste rock (erosion potential)	C02a	$109,000	$76,100	$185,100	$14,100	$199,200
	LOK002	BLM Polygon	Upland waste rock (erosion potential)	C02a	$107,000	$74,900	$181,900	$13,900	$195,800
	LOK004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
			Floodplain waste rock	C01	$257,000	$180,000	$437,000	$0	$437,000
				C07	$900,000	$630,000	$1,530,000	$198,000	$1,728,000
	LOK005	BLM Polygon	Upland waste rock (erosion potential)	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	LOK006	BLM Polygon	Floodplain waste rock	C01	$5,240	$3,670	$8,910	$0	$8,910
				C03	$58,500	$41,000	$99,500	$7,020	$106,520
	LOK007	BLM Polygon	Upland waste rock (erosion potential)	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	LOK008	BLM Polygon	Floodplain waste rock	C01	$7,660	$5,360	$13,020	$0	$13,020
				C03	$85,500	$59,900	$145,400	$10,300	$155,700
	LOK009	BLM Polygon	Floodplain waste rock	C01	$92,700	$64,900	$157,600	$0	$157,600
				C07	$325,000	$227,000	$552,000	$71,400	$623,400
	LOK010	BLM Polygon	Floodplain waste rock	C01	$2,820	$1,980	$4,800	$0	$4,800
				C03	$31,500	$22,100	$53,600	$3,780	$57,380
	LOK011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$3,620,000	$3,870,000	$7,490,000	$206,000	$7,696,000

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
			Floodplain waste rock	C01	$231,000	$162,000	$393,000	$0	$393,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	LOK017	BLM Polygon	Floodplain waste rock	C01	$26,000	$18,200	$44,200	$0	$44,200
				C03	$817,000	$572,000	$1,389,000	$98,000	$1,487,000
	LOK024	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	LOK048	BLM Polygon	Floodplain waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	LOK050	BLM Polygon	Upland tailings - inactive facilities	C01	$54,600	$38,200	$92,800	$0	$92,800
				C07	$191,000	$134,000	$325,000	$42,000	$367,000
	LOK051	BLM Polygon	Floodplain artificial fill	C02a	$161,000	$113,000	$274,000	$20,900	$294,900
	LOK053	BLM Polygon	Upland waste rock (erosion potential)	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	MUL001	BLM Polygon	Floodplain waste rock	C01	$317,000	$222,000	$539,000	$0	$539,000
				C07	$1,110,000	$775,000	$1,885,000	$244,000	$2,129,000
	MUL002	BLM Polygon	Upland tailings	C01	$96,600	$67,600	$164,200	$0	$164,200
				C07	$338,000	$237,000	$575,000	$74,400	$649,400
	MUL004	BLM Polygon	Floodplain waste rock	C01	$16,500	$11,600	$28,100	$0	$28,100
				C03	$185,000	$129,000	$314,000	$22,100	$336,100
	MUL006	BLM Polygon	Floodplain waste rock	C01	$14,700	$10,300	$25,000	$0	$25,000
				C03	$164,000	$115,000	$279,000	$19,700	$298,700
	MUL007	BLM Polygon	Upland waste rock (erosion potential)	C02a	$80,100	$56,100	$136,200	$10,400	$146,600
	MUL008	BLM Polygon	Floodplain waste rock	C01	$27,700	$19,400	$47,100	$0	$47,100
				C03	$302,000	$211,000	$513,000	$36,200	$549,200
	MUL009	BLM Polygon	Upland waste rock (erosion potential)	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$210,000	$224,000	$434,000	$15,500	$449,500
			Floodplain waste rock	C01	$454,000	$318,000	$772,000	$0	$772,000
				C03	$1,520,000	$1,060,000	$2,580,000	$182,000	$2,762,000
	MUL013	BLM Polygon	Upland waste rock (erosion potential)	C02a	$44,700	$31,300	$76,000	$5,810	$81,810
	MUL014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$1,100,000	$1,170,000	$2,270,000	$65,300	$2,335,300
			Upland waste rock (erosion potential)	C01	$6,650	$4,660	$11,310	$0	$11,310
				C03	$74,300	$52,000	$126,300	$8,910	$135,210
	MUL015	BLM Polygon	Upland waste rock (erosion potential)	C02a	$787,000	$551,000	$1,338,000	$102,000	$1,440,000
	MUL018	BLM Polygon	Floodplain waste rock	C01	$60,500	$42,300	$102,800	$0	$102,800
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	MUL019	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$558,000	$597,000	$1,155,000	$42,400	$1,197,400
			Buildings & structures	HH-3	$136,000	$95,100	$231,100	$6,790	$237,890
			Floodplain tailings	C01	$357,000	$250,000	$607,000	$0	$607,000
				C07	$1,250,000	$875,000	$2,125,000	$275,000	$2,400,000
			Floodplain waste rock	C01	$282,000	$198,000	$480,000	$0	$480,000
				C03	$3,970,000	$2,780,000	$6,750,000	$477,000	$7,227,000

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL020	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$5,090,000	$3,560,000	$8,650,000	$102,000	$8,752,000
			Floodplain tailings - active facilities	C09	$2,710,000	$1,900,000	$4,610,000	$543,000	$5,153,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$718	$63,218
	MUL021	BLM Polygon	Floodplain waste rock	C01	$24,400	$17,100	$41,500	$0	$41,500
			Floodplain waste rock	C03	$272,000	$191,000	$463,000	$32,700	$495,700
	MUL022	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL023	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Floodplain waste rock	C01	$131,000	$91,700	$222,700	$0	$222,700
				C07	$459,000	$321,000	$780,000	$101,000	$881,000
	MUL027	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$221,000	$155,000	$376,000	$547,000	$923,000
			Upland waste rock	C02b	$165,000	$116,000	$281,000	$21,500	$302,500
	MUL028	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$362,000	$253,000	$615,000	$1,100,000	$1,715,000
			Floodplain waste rock	C01	$85,700	$60,000	$145,700	$0	$145,700
				C03	$956,000	$669,000	$1,625,000	$115,000	$1,740,000
	MUL029	BLM Polygon	Floodplain waste rock	C01	$85,700	$60,000	$145,700	$0	$145,700
				C07	$300,000	$210,000	$510,000	$66,000	$576,000
	MUL030	BLM Polygon	Floodplain waste rock	C01	$7,260	$5,080	$12,340	$0	$12,340
				C03	$81,000	$56,700	$137,700	$9,720	$147,420
	MUL031	BLM Polygon	Upland waste rock (erosion potential)	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL033	BLM Polygon	Floodplain waste rock	C01	$66,500	$46,600	$113,100	$0	$113,100
				C07	$233,000	$163,000	$396,000	$51,200	$447,200
	MUL037	BLM Polygon	Floodplain sediments	C01b	$570,000	$399,000	$969,000	$0	$969,000
				C08a	$765,000	$535,000	$1,300,000	$107,000	$1,407,000
				HAUL-2	$237,000	$166,000	$403,000	$0	$403,000
			Floodplain sediments (underlying tailings pond)	C11j	$5,410,000	$3,780,000	$9,190,000	$108,000	$9,298,000
			Floodplain tailings - active facilities	C09	$2,470,000	$1,730,000	$4,200,000	$494,000	$4,694,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$718	$63,218
	MUL038	BLM Polygon	Floodplain tailings	C01	$54,600	$38,200	$92,800	$0	$92,800
				C07	$191,000	$134,000	$325,000	$42,000	$367,000
			Floodplain waste rock	C01	$55,800	$39,100	$94,900	$0	$94,900
				C03	$623,000	$436,000	$1,059,000	$74,800	$1,133,800
	MUL042	BLM Polygon	Floodplain waste rock	C01	$58,500	$40,900	$99,400	$0	$99,400
				C07	$205,000	$143,000	$348,000	$45,000	$393,000
	MUL043	BLM Polygon	Floodplain waste rock	C01	$73,600	$51,500	$125,100	$0	$125,100
				C07	$258,000	$180,000	$438,000	$56,700	$494,700
	MUL045	BLM Polygon	Floodplain waste rock	C01	$116,000	$81,100	$197,100	$0	$197,100
				C07	$406,000	$284,000	$690,000	$89,300	$779,300
	MUL047	BLM Polygon	Floodplain waste rock	C01	$4,640	$3,250	$7,890	$0	$7,890
				C03	$51,800	$36,200	$88,000	$6,210	$94,210

TABLE D-37
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL048	BLM Polygon	Floodplain waste rock	C01	$89,700	$62,800	$152,500	$0	$152,500
				C07	$314,000	$220,000	$534,000	$69,100	$603,100
	MUL049	BLM Polygon	Upland waste rock (erosion potential)	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL051	BLM Polygon	Floodplain waste rock	C01	$24,200	$16,900	$41,100	$0	$41,100
				C03	$270,000	$189,000	$459,000	$32,400	$491,400
	MUL052	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$390,000	$273,000	$663,000	$1,160,000	$1,823,000
			Floodplain waste rock	C01	$12,600	$8,820	$21,420	$0	$21,420
				C03	$299,000	$209,000	$508,000	$35,900	$543,900
	MUL053	BLM Polygon	Upland waste rock (erosion potential)	C02a	$266,000	$186,000	$452,000	$34,600	$486,600
	MUL054	BLM Polygon	Upland waste rock (erosion potential)	C02a	$79,200	$55,500	$134,700	$10,300	$145,000
	MUL056	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL057	BLM Polygon	Upland waste rock (erosion potential)	C02a	$66,600	$46,600	$113,200	$8,660	$121,860
	MUL058	BLM Polygon	Floodplain sediments	C01b	$1,850,000	$1,290,000	$3,140,000	$0	$3,140,000
				C08a	$2,480,000	$1,730,000	$4,210,000	$347,000	$4,557,000
				HAUL-2	$769,000	$538,000	$1,307,000	$0	$1,307,000
			Floodplain sediments (underlying tailings pond)	C11j	$9,700,000	$6,790,000	$16,490,000	$194,000	$16,684,000
			Floodplain tailings - active facilities	C09	$8,540,000	$5,980,000	$14,520,000	$1,710,000	$16,230,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$718	$63,218
	MUL059	BLM Polygon	Floodplain waste rock	C01	$94,800	$66,300	$161,100	$0	$161,100
				C07	$332,000	$232,000	$564,000	$73,000	$637,000
	MUL060	BLM Polygon	Floodplain waste rock	C01	$4,230	$2,960	$7,190	$0	$7,190
				C03	$47,300	$33,100	$80,400	$5,670	$86,070
	MUL063	BLM Polygon	Floodplain waste rock	C01	$4,230	$2,960	$7,190	$0	$7,190
				C03	$47,300	$33,100	$80,400	$5,670	$86,070
	MUL065	BLM Polygon	Floodplain waste rock	C01	$6,250	$4,370	$10,620	$0	$10,620
				C03	$69,800	$48,800	$118,600	$8,370	$126,970
	MUL071	BLM Polygon	Floodplain waste rock	C01	$2,100	$1,470	$3,570	$0	$3,570
				C03	$1,830,000	$1,280,000	$3,110,000	$220,000	$3,330,000
	MUL073	BLM Polygon	Upland waste rock	C02a	$174,000	$122,000	$296,000	$22,600	$318,600
	MUL081	BLM Polygon	Floodplain waste rock	C01	$6,720	$4,700	$11,420	$0	$11,420
				C03	$171,000	$120,000	$291,000	$20,500	$311,500
	MUL083	BLM Polygon	Floodplain waste rock	C01	$12,900	$9,030	$21,930	$0	$21,930
				C03	$144,000	$101,000	$245,000	$17,300	$262,300
	MUL103	BLM Polygon	Floodplain waste rock	C01	$5,290	$3,700	$8,990	$0	$8,990
				C03	$212,000	$148,000	$360,000	$25,400	$385,400
	MUL119	BLM Polygon	Upland waste rock (erosion potential)	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL120	BLM Polygon	Floodplain waste rock	C01	$470	$329	$799	$0	$799
				C03	$76,500	$53,600	$130,100	$9,180	$139,280
	MUL129	BLM Polygon	Floodplain waste rock	C01	$22,400	$15,700	$38,100	$0	$38,100
				C03	$250,000	$175,000	$425,000	$30,000	$455,000
	MUL131	BLM Polygon	Upland tailings	C01	$27,700	$19,400	$47,100	$0	$47,100

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C07	$97,000	$67,900	$164,900	$21,300	$186,200
	MUL132	BLM Polygon	Upland tailings	C01	$7,560	$5,290	$12,850	$0	$12,850
				C07	$26,500	$18,500	$45,000	$5,820	$50,820
	MUL135	BLM Polygon	Upland waste rock (erosion potential)	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL136	BLM Polygon	Upland waste rock (erosion potential)	C02a	$10,100	$7,080	$17,180	$1,320	$18,500
	MUL139	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL141	BLM Polygon	Floodplain sediments	C01b	$63,700	$44,600	$108,300	$0	$108,300
				C07	$70,900	$49,600	$120,500	$15,600	$136,100
	MUL142	BLM Polygon	Floodplain sediments	C01b	$226,000	$158,000	$384,000	$0	$384,000
				C07	$252,000	$176,000	$428,000	$55,500	$483,500
	MUL145	BLM Polygon	Floodplain sediments	C01b	$27,700	$19,400	$47,100	$0	$47,100
				C07	$30,900	$21,600	$52,500	$6,790	$59,290
	MUL146	BLM Polygon	Upland waste rock (erosion potential)	C01	$132,000	$92,400	$224,400	$0	$224,400
				C03	$295,000	$206,000	$501,000	$35,400	$536,400
	MUL149	BLM Polygon	Floodplain sediments	C01b	$37,300	$26,100	$63,400	$0	$63,400
				C07	$41,500	$29,100	$70,600	$9,140	$79,740
	MUL150	BLM Polygon	Floodplain sediments	C01b	$99,700	$69,800	$169,500	$0	$169,500
				C07	$111,000	$77,700	$188,700	$24,400	$213,100
	MUL153	BLM Polygon	Floodplain sediments	C01b	$50,200	$35,100	$85,300	$0	$85,300
				C07	$55,900	$39,100	$95,000	$12,300	$107,300
	THO020	BLM Polygon	Floodplain waste rock	C01	$5,850	$4,090	$9,940	$0	$9,940
				C03	$65,300	$45,700	$111,000	$7,830	$118,830
	UG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
				CD-AVG	$57,100	$39,900	$97,000	$17,100	$114,100
				CD-SED	$5,800	$4,060	$9,860	$34,800	$44,660
				FP/RP-AVG	$152,000	$106,000	$258,000	$27,300	$285,300
				VBS-AVG	$80,000	$56,000	$136,000	$24,000	$160,000
	UG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$42,700	$29,900	$72,600	$12,800	$85,400
				CD-AVG	$17,300	$12,100	$29,400	$5,190	$34,590
				CD-SED	$1,680	$1,180	$2,860	$10,100	$12,960
				FP/RP-AVG	$143,000	$100,000	$243,000	$25,800	$268,800
				VBS-AVG	$33,800	$23,700	$57,500	$10,100	$67,600
	UG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$541,000	$379,000	$920,000	$162,000	$1,082,000
				CD-AVG	$165,000	$115,000	$280,000	$49,400	$329,400
				CD-SED	$16,800	$11,800	$28,600	$101,000	$129,600
				FP/RP-AVG	$702,000	$491,000	$1,193,000	$126,000	$1,319,000
				VBS-AVG	$231,000	$161,000	$392,000	$69,200	$461,200
	UG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$297,000	$208,000	$505,000	$89,100	$594,100
				CD-AVG	$90,200	$63,200	$153,400	$27,100	$180,500
				CD-SED	$9,160	$6,410	$15,570	$55,000	$70,570
				FP/RP-AVG	$128,000	$89,900	$217,900	$23,100	$241,000

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				VBS-AVG	$127,000	$88,600	$215,600	$38,000	$253,600
	UG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$57,600	$40,300	$97,900	$17,300	$115,200
				CD-AVG	$17,500	$12,300	$29,800	$5,250	$35,050
				CD-SED	$1,680	$1,180	$2,860	$10,100	$12,960
				FP/RP-AVG	$21,900	$15,400	$37,300	$3,950	$41,250
				VBS-AVG	$24,500	$17,200	$41,700	$7,360	$49,060
	UG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$207,000	$145,000	$352,000	$62,000	$414,000
				CD-AVG	$62,800	$44,000	$106,800	$18,800	$125,600
				CD-SED	$6,360	$4,450	$10,810	$38,100	$48,910
				FP/RP-AVG	$6,850	$4,800	$11,650	$1,230	$12,880
				VBS-AVG	$88,100	$61,700	$149,800	$26,400	$176,200
	UG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$190,000	$133,000	$323,000	$57,000	$380,000
				CD-AVG	$55,600	$38,900	$94,500	$16,700	$111,200
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240
				FP/RP-AVG	$510,000	$357,000	$867,000	$91,800	$958,800
				VBS-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
	UG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$451,000	$316,000	$767,000	$135,000	$902,000
				CD-AVG	$137,000	$96,000	$233,000	$41,200	$274,200
				CD-SED	$13,800	$9,690	$23,490	$83,000	$106,490
				FP/RP-AVG	$657,000	$460,000	$1,117,000	$118,000	$1,235,000
				OFFCH-AVG	$744,000	$521,000	$1,265,000	$134,000	$1,399,000
				VBS-AVG	$192,000	$135,000	$327,000	$57,700	$384,700
	UG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$364,000	$255,000	$619,000	$109,000	$728,000
				CD-AVG	$111,000	$77,400	$188,400	$33,200	$221,600
				CD-SED	$11,200	$7,850	$19,050	$67,300	$86,350
				VBS-AVG	$155,000	$109,000	$264,000	$46,500	$310,500
	UG01-19	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$38,400	$26,900	$65,300	$11,500	$76,800
				CD-AVG	$13,400	$9,370	$22,770	$4,020	$26,790
				CD-SED	$1,310	$916	$2,226	$7,850	$10,076
				FP/RP-AVG	$36,800	$25,800	$62,600	$6,630	$69,230
				OFFCH-AVG	$46,300	$32,400	$78,700	$8,340	$87,040
				VBS-AVG	$30,400	$21,300	$51,700	$9,130	$60,830
	UG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$6,220	$4,360	$10,580	$1,870	$12,450
				VBS-AVG	$5,360	$3,750	$9,110	$1,610	$10,720
	UG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$133,000	$93,100	$226,100	$39,900	$266,000
				CD-AVG	$57,700	$40,400	$98,100	$17,300	$115,400
				CD-SED	$5,800	$4,060	$9,860	$34,800	$44,660
				FP/RP-AVG	$124,000	$87,100	$211,100	$22,400	$233,500
				VBS-AVG	$56,700	$39,700	$96,400	$17,000	$113,400
	UG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$171,000	$120,000	$291,000	$51,200	$342,200
				CD-AVG	$56,400	$39,500	$95,900	$16,900	$112,800
				CD-SED	$5,610	$3,930	$9,540	$33,700	$43,240

TABLE D-37
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				FP/RP-AVG	$906,000	$634,000	$1,540,000	$163,000	$1,703,000
				OFFCH-AVG	$97,600	$68,300	$165,900	$17,600	$183,500
				VBS-AVG	$135,000	$94,600	$229,600	$40,600	$270,200
	UG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$98,200	$68,700	$166,900	$29,500	$196,400
				CD-AVG	$48,400	$33,900	$82,300	$14,500	$96,800
				CD-SED	$4,860	$3,400	$8,260	$29,200	$37,460
				FP/RP-AVG	$281,000	$197,000	$478,000	$50,600	$528,600
				VBS-AVG	$77,700	$54,400	$132,100	$23,300	$155,400
	UG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$39,800	$27,800	$67,600	$11,900	$79,500
				CD-AVG	$15,000	$10,500	$25,500	$4,510	$30,010
				CD-SED	$1,500	$1,050	$2,550	$8,980	$11,530
				VBS-AVG	$14,800	$10,400	$25,200	$4,450	$29,650
	UG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$175,000	$123,000	$298,000	$52,500	$350,500
				CD-AVG	$73,500	$51,500	$125,000	$22,100	$147,100
				CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
				FP/RP-AVG	$206,000	$144,000	$350,000	$37,000	$387,000
				VBS-AVG	$139,000	$97,000	$236,000	$41,600	$277,600
	WAL013	BLM Polygon	Floodplain waste rock	C01	$6,850	$4,800	$11,650	$0	$11,650
				C03	$76,500	$53,600	$130,100	$9,180	$139,280
	WAL038	BLM Polygon	Floodplain sediments	C01b	$3,670,000	$2,570,000	$6,240,000	$0	$6,240,000
				C08a	$4,930,000	$3,450,000	$8,380,000	$690,000	$9,070,000
				HAUL-2	$1,530,000	$1,070,000	$2,600,000	$0	$2,600,000
	WAL076	BLM Polygon	Floodplain waste rock	C01	$171,000	$120,000	$291,000	$0	$291,000
				C07	$600,000	$420,000	$1,020,000	$132,000	$1,152,000
	WAL077	BLM Polygon	Floodplain sediments	C01b	$554,000	$388,000	$942,000	$0	$942,000
				C08a	$743,000	$520,000	$1,263,000	$104,000	$1,367,000
				HAUL-2	$231,000	$161,000	$392,000	$0	$392,000

Notes:

This Table does not include CTP Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

Typical Conceptual Design (TCD) Codes

BSBR-AVG = Bank Stabilization via Revetments - Average Cost
C01 = Excavation (dry)
C01b = Excavation (60% dry/40% wet)
C02a = Regrade/Consolidate/Vegetative Cover: Lower Part of Pile in 100-Year Floodplain

TABLE D-37

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)

C02b = Regrade/Consolidate/Vegetative Cover: Waste Rock Pile in Stream Valley
C02c = Regrade/Consolidate/Vegetative Cover: Stabilize Using Erosion Protection
C03 = Low-Permeability Cap
C04 = Low-Permeability Cap with Seepage Collection
C05 = Low-Permeability Cap with Erosion Protection
C07 = Waste Consolidation Area Above Flood Level
C08a = Regional Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
C14b = Stream Lining (20 feet wide)
C14c = Stream Lining (100 feet wide)
C15b = French Drain (15 feet bgs)
CD-AVG = Current Deflector Average Cost
CD-SED = Current Deflector Sediment Traps
CH REAL-1 = Channel Realignment
FP/RP-AVG = Floodplain and Riparian Replanting - Average Cost
HAUL-2 = Haul to Regional Repository
HH-2 = Upland Waste Pile Soil Cover
HH-3 = Millsite Decontamination
OFFCH-AVG = Off-Channel Hydrologic Feature Average Cost
PIPE-1 = Conveyance Pipeline (6-inch)
PIPE-2 = Conveyance Pipeline (12-inch)
PIPE-3 = Conveyance Pipeline (24-inch)
VBS-AVG = Vegetative Bank Stabilization - Average Cost
WT01 = Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (CTP)
WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)
WT03 = Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System

NOTE: The above costs are presented rounded to three significant figures
NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-38

Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
BigCrkSeg01	POL044	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL045	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	POL046	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL047	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL048	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	POL049	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	POL050	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL051	BLM Polygon	Upland waste rock	C02b	$33,400	$23,400	$56,800	$4,340	$61,140
	POL052	BLM Polygon	Floodplain waste rock	C01	$19,300	$13,500	$32,800	$0	$32,800
				C08a	$81,400	$57,000	$138,400	$11,400	$149,800
				HAUL-2	$25,300	$17,700	$43,000	$0	$43,000
BigCrkSeg02	POL024	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	POL025	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	POL026	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL027	BLM Polygon	Upland waste rock	C02a	$39,600	$27,700	$67,300	$5,150	$72,450
	POL028	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	POL036	BLM Polygon	Upland waste rock	C02a	$43,000	$30,100	$73,100	$5,590	$78,690
	POL037	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	POL038	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	POL039	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	POL040	BLM Polygon	Upland waste rock	C02b	$78,500	$54,900	$133,400	$10,200	$143,600
	POL041	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	POL042	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	POL043	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	POL053	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	POL054	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	POL056	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	POL062	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	POL063	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
BigCrkSeg03	POL001	BLM Polygon	Floodplain waste rock	C01	$34,300	$24,000	$58,300	$0	$58,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	POL002	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$223,000	$156,000	$379,000	$547,000	$926,000
			Floodplain waste rock	C01	$7,140	$5,000	$12,140	$0	$12,140
				C08a	$30,100	$21,100	$51,200	$4,210	$55,410
				HAUL-2	$9,330	$6,530	$15,860	$0	$15,860
	POL004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$285,000	$199,000	$484,000	$1,020,000	$1,504,000
			Upland waste rock	C02b	$35,100	$24,500	$59,600	$4,560	$64,160

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	POL067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
			Upland waste rock	C02a	$41,300	$28,900	$70,200	$5,370	$75,570
	POL068	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL069	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	POL070	BLM Polygon	Upland waste rock	C02b	$35,100	$24,500	$59,600	$4,560	$64,160
	POL071	BLM Polygon	Upland waste rock	C02b	$23,400	$16,400	$39,800	$3,040	$42,840
BigCrkSeg04	BIG04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$97,800	$237,800	$41,900	$279,700
				CD-AVG	$39,100	$27,400	$66,500	$11,700	$78,200
				VBS-AVG	$59,500	$41,700	$101,200	$17,900	$119,100
	BIG04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$573,000	$401,000	$974,000	$172,000	$1,146,000
				CD-AVG	$276,000	$193,000	$469,000	$82,800	$551,800
				FP/RP-AVG	$504,000	$353,000	$857,000	$90,700	$947,700
				OFFCH-AVG	$849,000	$595,000	$1,444,000	$153,000	$1,597,000
				VBS-AVG	$244,000	$171,000	$415,000	$73,300	$488,300
	KLE024	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$8,750,000	$6,120,000	$14,870,000	$175,000	$15,045,000
			Floodplain tailings - active facilities	C09	$10,400,000	$7,280,000	$17,680,000	$2,080,000	$19,760,000
			Groundwater	WT02	$376,000	$263,000	$639,000	$1,040,000	$1,679,000
	KLE025	BLM Polygon	Floodplain sediments	C01b	$132,000	$92,400	$224,400	$0	$224,400
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
			Floodplain tailings - inactive Facilities	C01	$1,700,000	$1,190,000	$2,890,000	$0	$2,890,000
				C08a	$7,150,000	$5,010,000	$12,160,000	$1,000,000	$13,160,000
				HAUL-2	$2,220,000	$1,550,000	$3,770,000	$0	$3,770,000
	KLE026	BLM Polygon	Floodplain waste rock	C01	$370,000	$259,000	$629,000	$0	$629,000
				C08a	$1,560,000	$1,090,000	$2,650,000	$218,000	$2,868,000
				HAUL-2	$483,000	$338,000	$821,000	$0	$821,000
	KLE027	BLM Polygon	Upland waste rock (erosion potential)	C01	$391,000	$274,000	$665,000	$0	$665,000
				C08a	$1,650,000	$1,150,000	$2,800,000	$231,000	$3,031,000
				HAUL-2	$511,000	$358,000	$869,000	$0	$869,000
	KLE029	BLM Polygon	Upland waste rock	C02a	$187,000	$131,000	$318,000	$24,300	$342,300
	KLE047	BLM Polygon	Floodplain sediments	C01b	$43,900	$30,700	$74,600	$0	$74,600
				C08a	$58,800	$41,200	$100,000	$8,230	$108,230
				HAUL-2	$18,200	$12,800	$31,000	$0	$31,000
	KLE053	BLM Polygon	Floodplain waste rock	C01	$826,000	$578,000	$1,404,000	$0	$1,404,000
				C08a	$3,480,000	$2,440,000	$5,920,000	$487,000	$6,407,000
				HAUL-2	$1,080,000	$756,000	$1,836,000	$0	$1,836,000
	KLE054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$672,000	$471,000	$1,143,000	$0	$1,143,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C08a	$2,830,000	$1,980,000	$4,810,000	$397,000	$5,207,000
				HAUL-2	$879,000	$615,000	$1,494,000	$0	$1,494,000
	KLE071	BLM Polygon	Floodplain sediments	C01b	$647,000	$453,000	$1,100,000	$0	$1,100,000
				C08a	$867,000	$607,000	$1,474,000	$121,000	$1,595,000
				HAUL-2	$269,000	$188,000	$457,000	$0	$457,000
	KLE073	BLM Polygon	Floodplain sediments	C01b	$1,320,000	$924,000	$2,244,000	$0	$2,244,000
				C08a	$1,770,000	$1,240,000	$3,010,000	$248,000	$3,258,000
				HAUL-2	$549,000	$384,000	$933,000	$0	$933,000
	POL005	BLM Polygon	Upland waste rock	C02b	$56,800	$39,700	$96,500	$7,380	$103,880
	POL006	BLM Polygon	Upland waste rock	C02b	$31,700	$22,200	$53,900	$4,120	$58,020
	POL008	BLM Polygon	Floodplain waste rock	C01	$34,300	$24,000	$58,300	$0	$58,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	POL010	BLM Polygon	Upland waste rock (erosion potential)	C01	$19,200	$13,400	$32,600	$0	$32,600
				C08a	$80,700	$56,500	$137,200	$11,300	$148,500
				HAUL-2	$25,000	$17,500	$42,500	$0	$42,500
	POL011	BLM Polygon	Floodplain waste rock	C01	$13,100	$9,170	$22,270	$0	$22,270
				C08a	$55,200	$38,700	$93,900	$7,730	$101,630
				HAUL-2	$17,100	$12,000	$29,100	$0	$29,100
	POL022	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$138,000	$96,800	$234,800	$527,000	$761,800
			Floodplain waste rock	C01	$19,300	$13,500	$32,800	$0	$32,800
				C08a	$81,400	$57,000	$138,400	$11,400	$149,800
				HAUL-2	$25,300	$17,700	$43,000	$0	$43,000
	POL023	BLM Polygon	Upland waste rock	C02b	$50,100	$35,100	$85,200	$6,510	$91,710
	POL066	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL075	BLM Polygon	Upland waste rock	C02b	$33,400	$23,400	$56,800	$4,340	$61,140
CCSeg	PIPECC	General Feature	Source General Information	PIPE-1	$1,430,000	$1,000,000	$2,430,000	$115,000	$2,545,000
				PIPE-2	$76,900	$53,800	$130,700	$6,150	$136,850
				PIPE-3	$1,800,000	$1,260,000	$3,060,000	$144,000	$3,204,000
	PIPECC	General Feature	Source General Information	PIPE-4	$4,090,000	$2,870,000	$6,960,000	$327,000	$7,287,000
CCSeg01	BUR102	BLM Polygon	Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR105	BLM Polygon	Upland waste rock (erosion potential)	C01	$27,300	$19,100	$46,400	$0	$46,400
				C07	$95,600	$66,900	$162,500	$21,000	$183,500
	BUR109	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C01	$115,000	$80,600	$195,600	$0	$195,600
				C07	$403,000	$282,000	$685,000	$88,600	$773,600
	BUR110	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	BUR182	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	BUR183	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	BUR184	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	BUR185	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR186	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR187	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR188	BLM Polygon	Upland waste rock	C02a	$36,200	$25,400	$61,600	$4,710	$66,310
	THO012	BLM Polygon	Upland waste rock	C02a	$27,800	$19,500	$47,300	$3,620	$50,920
	THO013	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	THO014	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	THO015	BLM Polygon	Upland waste rock	C02a	$34,600	$24,200	$58,800	$4,490	$63,290
	THO016	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	THO017	BLM Polygon	Upland waste rock	C02a	$45,500	$31,900	$77,400	$5,920	$83,320
	THO018	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	THO023	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
CCSeg02	BUR100	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	BUR106	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	BUR107	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C01	$584,000	$409,000	$993,000	$0	$993,000
				C07	$2,040,000	$1,430,000	$3,470,000	$450,000	$3,920,000
	BUR130	BLM Polygon	Upland waste rock (erosion potential)	C01	$12,600	$8,820	$21,420	$0	$21,420
				C07	$44,100	$30,900	$75,000	$9,700	$84,700
	BUR131	BLM Polygon	Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	BUR132	BLM Polygon	Upland waste rock (erosion potential)	C01	$386,000	$270,000	$656,000	$0	$656,000
				C07	$1,350,000	$947,000	$2,297,000	$298,000	$2,595,000
	BUR133	BLM Polygon	Upland waste rock (erosion potential)	C01	$22,300	$15,600	$37,900	$0	$37,900
				C07	$77,900	$54,500	$132,400	$17,100	$149,500
	BUR134	BLM Polygon	Upland waste rock (erosion potential)	C01	$60,500	$42,300	$102,800	$0	$102,800
				C07	$212,000	$148,000	$360,000	$46,600	$406,600
	BUR135	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR138	BLM Polygon	Upland waste rock	C02a	$48,900	$34,200	$83,100	$6,360	$89,460
	BUR145	BLM Polygon	Upland waste rock (erosion potential)	C01	$235,000	$165,000	$400,000	$0	$400,000
				C07	$823,000	$576,000	$1,399,000	$181,000	$1,580,000
	BUR150	BLM Polygon	Floodplain waste rock	C01	$137,000	$95,800	$232,800	$0	$232,800
				C08a	$577,000	$404,000	$981,000	$80,800	$1,061,800
				HAUL-2	$179,000	$125,000	$304,000	$0	$304,000
	BUR151	BLM Polygon	Upland waste rock	C02a	$148,000	$104,000	$252,000	$19,300	$271,300
	BUR153	BLM Polygon	Floodplain sediments	C01b	$462,000	$323,000	$785,000	$0	$785,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C08a	$620,000	$434,000	$1,054,000	$86,700	$1,140,700
				HAUL-2	$192,000	$135,000	$327,000	$0	$327,000
	CC02-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$405,000	$283,000	$688,000	$121,000	$809,000
				CD-AVG	$136,000	$95,200	$231,200	$40,800	$272,000
				FP/RP-AVG	$889,000	$622,000	$1,511,000	$160,000	$1,671,000
				VBS-AVG	$172,000	$121,000	$293,000	$51,700	$344,700
CCSeg03	BUR085	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
			Adit drainage	WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$34,600	$24,200	$58,800	$4,490	$63,290
	BUR086	BLM Polygon	Upland waste rock	C02a	$141,000	$98,500	$239,500	$18,300	$257,800
	BUR087	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C01	$105,000	$73,500	$178,500	$0	$178,500
				C07	$368,000	$257,000	$625,000	$80,900	$705,900
	BUR088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
	BUR089	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR090	BLM Polygon	Upland tailings	C01	$126,000	$88,200	$214,200	$0	$214,200
				C08a	$531,000	$372,000	$903,000	$74,300	$977,300
				HAUL-2	$165,000	$115,000	$280,000	$0	$280,000
			Upland waste rock (erosion potential)	C01	$231,000	$162,000	$393,000	$0	$393,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	BUR091	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	BUR092	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	BUR099	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	BUR101	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR146	BLM Polygon	Floodplain sediments	C01b	$673,000	$471,000	$1,144,000	$0	$1,144,000
				C08a	$903,000	$632,000	$1,535,000	$126,000	$1,661,000
				HAUL-2	$280,000	$196,000	$476,000	$0	$476,000
	BUR149	BLM Polygon	Upland waste rock (erosion potential)	C01	$43,700	$30,600	$74,300	$0	$74,300
				C07	$153,000	$107,000	$260,000	$33,600	$293,600
	BUR165	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	BUR166	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	BUR167	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	BUR179	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR180	BLM Polygon	Upland waste rock (erosion potential)	C01	$23,100	$16,200	$39,300	$0	$39,300

TABLE D-38
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C07	$80,900	$56,600	$137,500	$17,800	$155,300
CCSeg04	BUR063	BLM Polygon	Upland waste rock	C02a	$159,000	$112,000	$271,000	$20,700	$291,700
	BUR064	BLM Polygon	Upland waste rock	C02a	$34,600	$24,200	$58,800	$4,490	$63,290
	BUR065	BLM Polygon	Upland waste rock	C02a	$85,100	$59,600	$144,700	$11,100	$155,800
	BUR066	BLM Polygon	Upland waste rock (erosion potential)	C01	$29,400	$20,600	$50,000	$0	$50,000
				C08a	$124,000	$86,700	$210,700	$17,300	$228,000
				HAUL-2	$38,400	$26,900	$65,300	$0	$65,300
	BUR067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$950,000	$1,020,000	$1,970,000	$56,700	$2,026,700
			Upland tailings	C01	$10,500	$7,350	$17,850	$0	$17,850
				C08a	$44,300	$31,000	$75,300	$6,200	$81,500
				HAUL-2	$13,700	$9,610	$23,310	$0	$23,310
			Upland waste rock (potential intermixed tailings)	C01	$1,470,000	$1,030,000	$2,500,000	$0	$2,500,000
				C08a	$6,200,000	$4,340,000	$10,540,000	$867,000	$11,407,000
				HAUL-2	$1,920,000	$1,350,000	$3,270,000	$0	$3,270,000
	BUR068	BLM Polygon	Upland waste rock (erosion potential)	C01	$50,400	$35,300	$85,700	$0	$85,700
				C08a	$212,000	$149,000	$361,000	$29,700	$390,700
				HAUL-2	$65,900	$46,100	$112,000	$0	$112,000
	BUR069	BLM Polygon	Upland waste rock	C02a	$88,500	$62,000	$150,500	$11,500	$162,000
	BUR070	BLM Polygon	Upland waste rock	C02a	$237,000	$166,000	$403,000	$30,800	$433,800
	BUR071	BLM Polygon	Upland waste rock	C02a	$166,000	$116,000	$282,000	$21,600	$303,600
	BUR072	BLM Polygon	Upland waste rock (erosion potential)	C01	$60,100	$42,000	$102,100	$0	$102,100
				C08a	$253,000	$177,000	$430,000	$35,400	$465,400
				HAUL-2	$78,500	$55,000	$133,500	$0	$133,500
	BUR073	BLM Polygon	Upland waste rock (erosion potential)	C01	$529,000	$370,000	$899,000	$0	$899,000
				C08a	$2,230,000	$1,560,000	$3,790,000	$312,000	$4,102,000
				HAUL-2	$692,000	$484,000	$1,176,000	$0	$1,176,000
	BUR074	BLM Polygon	Upland waste rock	C02a	$145,000	$101,000	$246,000	$18,800	$264,800
	BUR075	BLM Polygon	Upland tailings	C01	$14,700	$10,300	$25,000	$0	$25,000
				C08a	$62,000	$43,400	$105,400	$8,670	$114,070
				HAUL-2	$19,200	$13,500	$32,700	$0	$32,700
			Upland waste rock	C02a	$148,000	$103,000	$251,000	$19,200	$270,200
	BUR076	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	BUR093	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	BUR094	BLM Polygon	Upland waste rock (erosion potential)	C02a	$118,000	$82,600	$200,600	$15,300	$215,900
	BUR095	BLM Polygon	Upland waste rock (erosion potential)	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	BUR096	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,890	$5,230	$10,120	$291	$10,411
			Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR097	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$869,000	$929,000	$1,798,000	$51,700	$1,849,700
			Upland waste rock	C02a	$73,300	$51,300	$124,600	$9,530	$134,130

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	BUR098	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$905,000	$968,000	$1,873,000	$70,400	$1,943,400
			Upland waste rock (potential intermixed tailings)	C01	$231,000	$162,000	$393,000	$0	$393,000
				C08a	$974,000	$681,000	$1,655,000	$136,000	$1,791,000
				HAUL-2	$302,000	$211,000	$513,000	$0	$513,000
	BUR111	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	BUR112	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock	C02a	$111,000	$77,900	$188,900	$14,500	$203,400
	BUR113	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	BUR114	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C02a	$98,600	$69,000	$167,600	$12,800	$180,400
	BUR115	BLM Polygon	Upland waste rock	C02a	$49,700	$34,800	$84,500	$6,470	$90,970
	BUR116	BLM Polygon	Upland waste rock (erosion potential)	C02a	$27,800	$19,500	$47,300	$3,620	$50,920
	BUR117	BLM Polygon	Upland tailings	C01	$7,560	$5,290	$12,850	$0	$12,850
				C08a	$31,900	$22,300	$54,200	$4,460	$58,660
				HAUL-2	$9,880	$6,920	$16,800	$0	$16,800
			Upland waste rock (potential intermixed tailings)	C01	$609,000	$426,000	$1,035,000	$0	$1,035,000
				C08a	$2,570,000	$1,800,000	$4,370,000	$359,000	$4,729,000
				HAUL-2	$796,000	$557,000	$1,353,000	$0	$1,353,000
	BUR118	BLM Polygon	Upland waste rock (erosion potential)	C01	$139,000	$97,000	$236,000	$0	$236,000
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	BUR119	BLM Polygon	Upland waste rock	C02a	$175,000	$123,000	$298,000	$22,800	$320,800
	BUR120	BLM Polygon	Upland waste rock (erosion potential)	C02a	$78,400	$54,900	$133,300	$10,200	$143,500
	BUR121	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$682,000	$729,000	$1,411,000	$40,600	$1,451,600
			Upland waste rock (erosion potential)	C01	$433,000	$303,000	$736,000	$0	$736,000
				C08a	$1,820,000	$1,280,000	$3,100,000	$255,000	$3,355,000
				HAUL-2	$565,000	$396,000	$961,000	$0	$961,000
	BUR122	BLM Polygon	Upland waste rock (erosion potential)	C01	$113,000	$79,400	$192,400	$0	$192,400
				C08a	$478,000	$335,000	$813,000	$66,900	$879,900
				HAUL-2	$148,000	$104,000	$252,000	$0	$252,000
	BUR123	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	BUR124	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C02a	$84,300	$59,000	$143,300	$11,000	$154,300
	BUR125	BLM Polygon	Upland waste rock (erosion potential)	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR126	BLM Polygon	Upland waste rock	C02a	$39,600	$27,700	$67,300	$5,150	$72,450

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	BUR127	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	BUR128	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$199,000	$213,000	$412,000	$11,800	$423,800
			Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Upland tailings	C01	$182,000	$128,000	$310,000	$0	$310,000
				C08a	$768,000	$538,000	$1,306,000	$108,000	$1,414,000
				HAUL-2	$238,000	$167,000	$405,000	$0	$405,000
	BUR129	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland tailings	C01	$22,100	$15,400	$37,500	$0	$37,500
				C08a	$92,900	$65,000	$157,900	$13,000	$170,900
				HAUL-2	$28,800	$20,200	$49,000	$0	$49,000
	BUR141	BLM Polygon	Floodplain sediments	C01b	$290,000	$203,000	$493,000	$0	$493,000
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	BUR142	BLM Polygon	Upland tailings	C01	$20,600	$14,400	$35,000	$0	$35,000
				C08a	$86,700	$60,700	$147,400	$12,100	$159,500
				HAUL-2	$26,900	$18,800	$45,700	$0	$45,700
			Upland waste rock (potential intermixed tailings)	C01	$305,000	$213,000	$518,000	$0	$518,000
				C08a	$1,280,000	$898,000	$2,178,000	$180,000	$2,358,000
				HAUL-2	$398,000	$279,000	$677,000	$0	$677,000
	BUR143	BLM Polygon	Floodplain sediments	C01b	$422,000	$296,000	$718,000	$0	$718,000
				C08a	$566,000	$396,000	$962,000	$79,300	$1,041,300
				HAUL-2	$176,000	$123,000	$299,000	$0	$299,000
	BUR144	BLM Polygon	Upland waste rock (erosion potential)	C01	$164,000	$115,000	$279,000	$0	$279,000
				C08a	$690,000	$483,000	$1,173,000	$96,600	$1,269,600
				HAUL-2	$214,000	$150,000	$364,000	$0	$364,000
	BUR174	BLM Polygon	Upland waste rock	C02a	$427,000	$299,000	$726,000	$55,500	$781,500
	BUR175	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	BUR176	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	BUR177	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	BUR178	BLM Polygon	Upland waste rock (erosion potential)	C01	$46,200	$32,300	$78,500	$0	$78,500
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
	BUR189	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	BUR190	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				WT01	$302,000	$323,000	$625,000	$12,900	$637,900
	BUR191	BLM Polygon	Upland waste rock	C02a	$131,000	$91,500	$222,500	$17,000	$239,500
	BUR192	BLM Polygon	Floodplain tailings (discrete site)	C01	$13,000	$9,110	$22,110	$0	$22,110
				C08a	$54,900	$38,400	$93,300	$7,680	$100,980
				HAUL-2	$17,000	$11,900	$28,900	$0	$28,900
			Upland waste rock (erosion potential)	C01	$113,000	$79,400	$192,400	$0	$192,400
				C08a	$478,000	$335,000	$813,000	$66,900	$879,900
				HAUL-2	$148,000	$104,000	$252,000	$0	$252,000
	BUR193	BLM Polygon	Upland waste rock	C02a	$63,200	$44,300	$107,500	$8,220	$115,720
	BUR194	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	BUR195	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	BUR198	BLM Polygon	Upland waste rock	C02a	$114,000	$79,700	$193,700	$14,800	$208,500
	BUR199	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR200	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	BUR202	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	BUR203	BLM Polygon	Upland waste rock	C02a	$10,100	$7,080	$17,180	$1,320	$18,500
	BUR204	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	CC04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$1,220,000	$854,000	$2,074,000	$366,000	$2,440,000
				CD-AVG	$412,000	$288,000	$700,000	$124,000	$824,000
				FP/RP-AVG	$3,190,000	$2,230,000	$5,420,000	$574,000	$5,994,000
				OFFCH-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$520,000	$364,000	$884,000	$156,000	$1,040,000
CCSeg05	CC05-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$136,000	$94,900	$230,900	$40,700	$271,600
				CD-AVG	$22,700	$15,900	$38,600	$6,800	$45,400
				FP/RP-AVG	$4,810,000	$3,370,000	$8,180,000	$865,000	$9,045,000
				OFFCH-AVG	$16,000,000	$11,200,000	$27,200,000	$2,890,000	$30,090,000
				VBS-AVG	$57,800	$40,400	$98,200	$17,300	$115,500
	CC05-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$820,000	$574,000	$1,394,000	$246,000	$1,640,000
				CD-AVG	$138,000	$96,600	$234,600	$41,400	$276,000
				CH REAL-1	$3,780,000	$2,650,000	$6,430,000	$643,000	$7,073,000
				FP/RP-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$350,000	$245,000	$595,000	$105,000	$700,000
	OSB047	BLM Polygon	Floodplain sediments	C01B	$224,000	$157,000	$381,000	$0	$381,000
				C08a	$301,000	$211,000	$512,000	$42,100	$554,100
				HAUL-2	$93,300	$65,300	$158,600	$0	$158,600
	WAL009	BLM Polygon	Floodplain sediments (underlying tailings pond)	C01B	$4,260,000	$2,980,000	$7,240,000	$0	$7,240,000
				C08a	$5,720,000	$4,000,000	$9,720,000	$800,000	$10,520,000
				HAUL-2	$1,770,000	$1,240,000	$3,010,000	$0	$3,010,000
			Floodplain tailings - inactive Facilities	C01	$8,820,000	$6,170,000	$14,990,000	$0	$14,990,000
				C08a	$37,200,000	$26,000,000	$63,200,000	$5,200,000	$68,400,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				HAUL-2	$11,500,000	$8,070,000	$19,570,000	$0	$19,570,000
	WAL010	BLM Polygon	Floodplain sediments	C01B	$198,000	$139,000	$337,000	$0	$337,000
				C08a	$266,000	$186,000	$452,000	$37,200	$489,200
				HAUL-2	$82,400	$57,600	$140,000	$0	$140,000
	WAL011	BLM Polygon	Floodplain sediments	C01B	$116,000	$81,300	$197,300	$0	$197,300
				C08a	$156,000	$109,000	$265,000	$21,800	$286,800
				HAUL-2	$48,300	$33,800	$82,100	$0	$82,100
			Upland tailings	C01	$48,700	$34,100	$82,800	$0	$82,800
				C08a	$205,000	$144,000	$349,000	$28,700	$377,700
				HAUL-2	$63,700	$44,600	$108,300	$0	$108,300
	WAL039	BLM Polygon	Upland tailings	C01	$52,500	$36,800	$89,300	$0	$89,300
				C08a	$221,000	$155,000	$376,000	$31,000	$407,000
				HAUL-2	$68,600	$48,000	$116,600	$0	$116,600
	WAL040	BLM Polygon	Floodplain sediments	C01B	$238,000	$166,000	$404,000	$0	$404,000
				C08a	$319,000	$223,000	$542,000	$44,600	$586,600
				HAUL-2	$98,800	$69,200	$168,000	$0	$168,000
	WAL041	BLM Polygon	Floodplain sediments	C01B	$475,000	$333,000	$808,000	$0	$808,000
				C08a	$637,000	$446,000	$1,083,000	$89,200	$1,172,200
				HAUL-2	$198,000	$138,000	$336,000	$0	$336,000
	WAL042	BLM Polygon	Floodplain sediments	C01B	$107,000	$74,800	$181,800	$0	$181,800
				C08a	$143,000	$100,000	$243,000	$20,100	$263,100
				HAUL-2	$44,500	$31,100	$75,600	$0	$75,600
			Floodplain tailings - inactive Facilities	C01	$2,520,000	$1,760,000	$4,280,000	$0	$4,280,000
				C08a	$10,600,000	$7,430,000	$18,030,000	$1,490,000	$19,520,000
				HAUL-2	$3,290,000	$2,310,000	$5,600,000	$0	$5,600,000
	WAL081	BLM Polygon	Floodplain artificial fill	C01	$23,900	$16,800	$40,700	$0	$40,700
				C08a	$101,000	$70,600	$171,600	$14,100	$185,700
				HAUL-2	$31,300	$21,900	$53,200	$0	$53,200
MIDGradSeg	PIPEMG	General Feature	Source General Information	PIPE-1	$417,000	$292,000	$709,000	$33,300	$742,300
				PIPE-2	$40,400	$28,300	$68,700	$3,230	$71,930
				PIPE-4	$12,100,000	$8,480,000	$20,580,000	$969,000	$21,549,000
MIDGradSeg01	KLE004	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	KLE005	BLM Polygon	Upland waste rock	C02a	$54,000	$37,800	$91,800	$7,010	$98,810
	KLE006	BLM Polygon	Upland waste rock	C02a	$115,000	$80,800	$195,800	$15,000	$210,800
	KLE011	BLM Polygon	Upland tailings - inactive facilities	C01	$344,000	$241,000	$585,000	$0	$585,000
				C08a	$1,450,000	$1,020,000	$2,470,000	$203,000	$2,673,000
				HAUL-2	$450,000	$315,000	$765,000	$0	$765,000
	KLE016	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE020	BLM Polygon	Upland waste rock (erosion potential)	C01	$151,000	$106,000	$257,000	$0	$257,000
				C08a	$637,000	$446,000	$1,083,000	$89,200	$1,172,200

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				HAUL-2	$198,000	$138,000	$336,000	$0	$336,000
	KLE021	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE022	BLM Polygon	Upland waste rock	C02a	$88,500	$62,000	$150,500	$11,500	$162,000
	KLE023	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE032	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	KLE033	BLM Polygon	Upland waste rock (erosion potential)	C01	$105,000	$73,500	$178,500	$0	$178,500
				C08a	$443,000	$310,000	$753,000	$62,000	$815,000
				HAUL-2	$137,000	$96,100	$233,100	$0	$233,100
	KLE034	BLM Polygon	Floodplain waste rock	C01	$92,400	$64,700	$157,100	$0	$157,100
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	KLE035	BLM Polygon	Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Floodplain waste rock	C01	$504,000	$353,000	$857,000	$0	$857,000
				C08a	$2,120,000	$1,490,000	$3,610,000	$297,000	$3,907,000
				HAUL-2	$659,000	$461,000	$1,120,000	$0	$1,120,000
	KLE036	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	KLE038	BLM Polygon	Upland waste rock	C02a	$307,000	$215,000	$522,000	$39,900	$561,900
	KLE039	BLM Polygon	Upland waste rock (erosion potential)	C01	$147,000	$103,000	$250,000	$0	$250,000
				C08a	$620,000	$434,000	$1,054,000	$86,700	$1,140,700
				HAUL-2	$192,000	$135,000	$327,000	$0	$327,000
	KLE040	BLM Polygon	Floodplain sediments	C01b	$1,480,000	$1,030,000	$2,510,000	$0	$2,510,000
				C08a	$1,980,000	$1,390,000	$3,370,000	$278,000	$3,648,000
				HAUL-2	$615,000	$430,000	$1,045,000	$0	$1,045,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	KLE042	BLM Polygon	Floodplain sediments	C01b	$660,000	$462,000	$1,122,000	$0	$1,122,000
				C08a	$885,000	$620,000	$1,505,000	$124,000	$1,629,000
				HAUL-2	$275,000	$192,000	$467,000	$0	$467,000
			Floodplain tailings	C01	$54,600	$38,200	$92,800	$0	$92,800
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	KLE048	BLM Polygon	Floodplain sediments	C01b	$1,580,000	$1,110,000	$2,690,000	$0	$2,690,000
				C08a	$2,120,000	$1,480,000	$3,600,000	$297,000	$3,897,000
				C14c	$8,910,000	$6,240,000	$15,150,000	$267,000	$15,417,000
				C15b	$2,720,000	$1,900,000	$4,620,000	$54,400	$4,674,400
				HAUL-2	$657,000	$460,000	$1,117,000	$0	$1,117,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	KLE049	BLM Polygon	Floodplain sediments	C01b	$1,720,000	$1,200,000	$2,920,000	$0	$2,920,000
				C08a	$2,300,000	$1,610,000	$3,910,000	$322,000	$4,232,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C14c	$7,430,000	$5,200,000	$12,630,000	$223,000	$12,853,000
				C15b	$2,270,000	$1,590,000	$3,860,000	$45,400	$3,905,400
				HAUL-2	$714,000	$500,000	$1,214,000	$0	$1,214,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	KLE051	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE056	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	KLE057	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	KLE058	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	KLE059	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	KLE060	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	KLE062	BLM Polygon	Floodplain sediments	C01b	$343,000	$240,000	$583,000	$0	$583,000
				C08a	$460,000	$322,000	$782,000	$64,400	$846,400
				HAUL-2	$143,000	$99,900	$242,900	$0	$242,900
			Upland waste rock	C02a	$278,000	$195,000	$473,000	$36,200	$509,200
	KLE066	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE067	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$267,000	$187,000	$454,000	$1,010,000	$1,464,000
			Upland waste rock (erosion potential)	C01	$116,000	$80,900	$196,900	$0	$196,900
				C08a	$487,000	$341,000	$828,000	$68,100	$896,100
				HAUL-2	$151,000	$106,000	$257,000	$0	$257,000
	KLE068	BLM Polygon	Upland waste rock (erosion potential)	C01	$58,800	$41,200	$100,000	$0	$100,000
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	KLE069	BLM Polygon	Upland waste rock (erosion potential)	C01	$5,460	$3,820	$9,280	$0	$9,280
				C08a	$23,000	$16,100	$39,100	$3,220	$42,320
				HAUL-2	$7,140	$5,000	$12,140	$0	$12,140
	KLE070	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE074	BLM Polygon	Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Upland tailings	C01	$58,800	$41,200	$100,000	$0	$100,000
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	KLE075	BLM Polygon	Upland tailings	C01	$16,800	$11,800	$28,600	$0	$28,600
				C08a	$70,800	$49,600	$120,400	$9,910	$130,310
				HAUL-2	$22,000	$15,400	$37,400	$0	$37,400
	MG01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$110,000	$76,900	$186,900	$32,900	$219,800
				CD-AVG	$59,700	$41,800	$101,500	$17,900	$119,400

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				FP/RP-AVG	$47,000	$32,900	$79,900	$8,460	$88,360
	MG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$104,000	$72,600	$176,600	$31,100	$207,700
				CD-AVG	$10,300	$7,210	$17,510	$3,090	$20,600
				FP/RP-AVG	$409,000	$286,000	$695,000	$73,600	$768,600
				OFFCH-AVG	$2,990,000	$2,090,000	$5,080,000	$538,000	$5,618,000
				VBS-AVG	$44,200	$30,900	$75,100	$13,300	$88,400
	MG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$140,000	$98,200	$238,200	$42,100	$280,300
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				FP/RP-AVG	$173,000	$121,000	$294,000	$31,200	$325,200
				VBS-AVG	$59,800	$41,900	$101,700	$17,900	$119,600
	MG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$134,000	$93,900	$227,900	$40,300	$268,200
				CD-AVG	$30,900	$21,600	$52,500	$9,270	$61,770
				FP/RP-AVG	$238,000	$166,000	$404,000	$42,800	$446,800
				VBS-AVG	$57,200	$40,000	$97,200	$17,200	$114,400
	MG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$47,400	$33,200	$80,600	$14,200	$94,800
				CH REAL-1	$1,270,000	$892,000	$2,162,000	$217,000	$2,379,000
				FP/RP-AVG	$715,000	$500,000	$1,215,000	$129,000	$1,344,000
				OFFCH-AVG	$2,710,000	$1,900,000	$4,610,000	$488,000	$5,098,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$92,500	$64,700	$157,200	$27,700	$184,900
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				CH REAL-1	$426,000	$298,000	$724,000	$72,500	$796,500
				FP/RP-AVG	$61,900	$43,300	$105,200	$11,100	$116,300
				OFFCH-AVG	$55,700	$39,000	$94,700	$10,000	$104,700
				VBS-AVG	$39,400	$27,600	$67,000	$11,800	$78,800
	MG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$236,000	$165,000	$401,000	$70,700	$471,700
				CD-AVG	$39,100	$27,400	$66,500	$11,700	$78,200
				FP/RP-AVG	$966,000	$676,000	$1,642,000	$174,000	$1,816,000
				OFFCH-AVG	$1,800,000	$1,260,000	$3,060,000	$324,000	$3,384,000
				VBS-AVG	$30,200	$21,100	$51,300	$9,050	$60,350
	MG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$131,000	$91,500	$222,500	$39,200	$261,700
				CD-AVG	$22,700	$15,900	$38,600	$6,800	$45,400
				FP/RP-AVG	$60,300	$42,200	$102,500	$10,900	$113,400
				OFFCH-AVG	$1,400,000	$979,000	$2,379,000	$252,000	$2,631,000
				VBS-AVG	$16,700	$11,700	$28,400	$5,010	$33,410
	MG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$334,000	$234,000	$568,000	$100,000	$668,000
				CD-AVG	$55,600	$38,900	$94,500	$16,700	$111,200
				CH REAL-1	$1,540,000	$1,080,000	$2,620,000	$262,000	$2,882,000
				FP/RP-AVG	$1,400,000	$981,000	$2,381,000	$252,000	$2,633,000
				OFFCH-AVG	$1,100,000	$772,000	$1,872,000	$198,000	$2,070,000
				VBS-AVG	$142,000	$99,700	$241,700	$42,700	$284,400

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$167,000	$117,000	$284,000	$50,000	$334,000
				CD-AVG	$28,800	$20,200	$49,000	$8,650	$57,650
				CH REAL-1	$768,000	$538,000	$1,306,000	$131,000	$1,437,000
				FP/RP-AVG	$545,000	$381,000	$926,000	$98,000	$1,024,000
				OFFCH-AVG	$231,000	$162,000	$393,000	$41,500	$434,500
				VBS-AVG	$71,000	$49,700	$120,700	$21,300	$142,000
	MG01-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$33,000	$23,100	$56,100	$9,890	$65,990
				FP/RP-AVG	$133,000	$92,900	$225,900	$23,900	$249,800
	MG01-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$189,000	$132,000	$321,000	$56,700	$377,700
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				FP/RP-AVG	$557,000	$390,000	$947,000	$100,000	$1,047,000
				VBS-AVG	$80,600	$56,400	$137,000	$24,200	$161,200
	MG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$305,000	$214,000	$519,000	$91,500	$610,500
				CD-AVG	$119,000	$83,600	$202,600	$35,800	$238,400
				FP/RP-AVG	$874,000	$612,000	$1,486,000	$157,000	$1,643,000
				VBS-AVG	$130,000	$91,000	$221,000	$39,000	$260,000
	MG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$97,600	$68,300	$165,900	$29,300	$195,200
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				FP/RP-AVG	$833,000	$583,000	$1,416,000	$150,000	$1,566,000
				VBS-AVG	$41,600	$29,100	$70,700	$12,500	$83,200
	MG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$384,000	$269,000	$653,000	$115,000	$768,000
				CD-AVG	$78,300	$54,800	$133,100	$23,500	$156,600
				FP/RP-AVG	$1,900,000	$1,330,000	$3,230,000	$342,000	$3,572,000
				OFFCH-AVG	$3,240,000	$2,270,000	$5,510,000	$583,000	$6,093,000
				VBS-AVG	$164,000	$115,000	$279,000	$49,100	$328,100
	MG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$433,000	$303,000	$736,000	$130,000	$866,000
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				FP/RP-AVG	$487,000	$341,000	$828,000	$87,700	$915,700
				OFFCH-AVG	$440,000	$308,000	$748,000	$79,100	$827,100
				VBS-AVG	$185,000	$129,000	$314,000	$55,400	$369,400
	MG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$286,000	$200,000	$486,000	$85,900	$571,900
				CD-AVG	$47,400	$33,200	$80,600	$14,200	$94,800
				CH REAL-1	$1,320,000	$924,000	$2,244,000	$225,000	$2,469,000
				FP/RP-AVG	$3,150,000	$2,200,000	$5,350,000	$566,000	$5,916,000
				OFFCH-AVG	$2,620,000	$1,830,000	$4,450,000	$471,000	$4,921,000
				VBS-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
	MG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$68,000	$47,600	$115,600	$20,400	$136,000
				CD-AVG	$12,400	$8,650	$21,050	$3,710	$24,760
				CH REAL-1	$314,000	$219,000	$533,000	$53,300	$586,300
				FP/RP-AVG	$30,600	$21,400	$52,000	$5,520	$57,520
				VBS-AVG	$29,000	$20,300	$49,300	$8,690	$57,990

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL085	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$1,090,000	$766,000	$1,856,000	$1,680,000	$3,536,000
			Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MUL086	BLM Polygon	Upland waste rock (erosion potential)	C01	$126,000	$88,200	$214,200	$0	$214,200
				C08a	$531,000	$372,000	$903,000	$74,300	$977,300
				HAUL-2	$165,000	$115,000	$280,000	$0	$280,000
	MUL087	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	OSB024	BLM Polygon	Upland waste rock	C02a	$54,800	$38,400	$93,200	$7,120	$100,320
	OSB025	BLM Polygon	Upland waste rock (erosion potential)	C01	$50,400	$35,300	$85,700	$0	$85,700
				C08a	$212,000	$149,000	$361,000	$29,700	$390,700
				HAUL-2	$65,900	$46,100	$112,000	$0	$112,000
	OSB026	BLM Polygon	Upland waste rock	C02a	$65,800	$46,000	$111,800	$8,550	$120,350
	OSB027	BLM Polygon	Upland waste rock	C02a	$100,000	$70,200	$170,200	$13,000	$183,200
	OSB028	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	OSB030	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB065	BLM Polygon	Floodplain sediments	C01b	$6,100,000	$4,270,000	$10,370,000	$0	$10,370,000
				C08a	$8,180,000	$5,720,000	$13,900,000	$1,140,000	$15,040,000
				C14c	$65,300,000	$45,700,000	$111,000,000	$1,960,000	$112,960,000
				C15b	$20,000,000	$14,000,000	$34,000,000	$399,000	$34,399,000
				HAUL-2	$2,540,000	$1,780,000	$4,320,000	$0	$4,320,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	OSB070	BLM Polygon	Upland waste rock (erosion potential)	C01	$130,000	$91,100	$221,100	$0	$221,100
				C08a	$549,000	$384,000	$933,000	$76,800	$1,009,800
				HAUL-2	$170,000	$119,000	$289,000	$0	$289,000
	OSB071	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	OSB072	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB073	BLM Polygon	Upland waste rock (erosion potential)	C01	$92,400	$64,700	$157,100	$0	$157,100
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	OSB074	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	OSB075	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB076	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				WT03	$139,000	$97,200	$236,200	$528,000	$764,200
			Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB078	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB079	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	OSB080	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$145,000	$102,000	$247,000	$529,000	$776,000
			Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	OSB117	BLM Polygon	Floodplain tailings	C01	$58,800	$41,200	$100,000	$0	$100,000
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	OSB118	BLM Polygon	Floodplain sediments	C01b	$792,000	$554,000	$1,346,000	$0	$1,346,000
				C08a	$1,060,000	$743,000	$1,803,000	$149,000	$1,952,000
				HAUL-2	$329,000	$231,000	$560,000	$0	$560,000
	OSB119	BLM Polygon	Floodplain sediments (underlying tailings pond)	C01b	$4,220,000	$2,950,000	$7,170,000	$0	$7,170,000
				C08a	$5,660,000	$3,960,000	$9,620,000	$792,000	$10,412,000
				C11j	$11,100,000	$7,790,000	$18,890,000	$223,000	$19,113,000
				HAUL-2	$1,760,000	$1,230,000	$2,990,000	$0	$2,990,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$1,800	$64,300
	OSB120	BLM Polygon	Floodplain sediments	C01b	$6,340,000	$4,440,000	$10,780,000	$0	$10,780,000
				C08a	$8,500,000	$5,950,000	$14,450,000	$1,190,000	$15,640,000
				C14c	$41,600,000	$29,100,000	$70,700,000	$1,250,000	$71,950,000
				C15b	$12,700,000	$8,890,000	$21,590,000	$254,000	$21,844,000
				HAUL-2	$2,640,000	$1,840,000	$4,480,000	$0	$4,480,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	POL015	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	POL016	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	POL017	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	POL018	BLM Polygon	Upland waste rock (erosion potential)	C01	$92,400	$64,700	$157,100	$0	$157,100
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
	POL019	BLM Polygon	Upland waste rock (erosion potential)	C01	$840,000	$588,000	$1,428,000	$0	$1,428,000
				C08a	$3,540,000	$2,480,000	$6,020,000	$496,000	$6,516,000
				HAUL-2	$1,100,000	$769,000	$1,869,000	$0	$1,869,000
	POL020	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	POL021	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL029	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	POL030	BLM Polygon	Upland waste rock	C02a	$40,500	$28,300	$68,800	$5,260	$74,060
	POL031	BLM Polygon	Upland waste rock	C02a	$36,200	$25,400	$61,600	$4,710	$66,310
	POL032	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL033	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL034	BLM Polygon	Upland waste rock	C02a	$69,100	$48,400	$117,500	$8,990	$126,490
	POL035	BLM Polygon	Upland waste rock	C02a	$165,000	$116,000	$281,000	$21,500	$302,500
	POL055	BLM Polygon	Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	POL057	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL058	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	POL059	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	POL060	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	POL061	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560
	POL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	POL065	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	POL077	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	POL078	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	POL079	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL080	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	POL081	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL082	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL083	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL084	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	POL085	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	POL086	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL087	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	POL088	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	POL089	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	POL090	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	POL091	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	POL092	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	WAL001	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$13,400,000	$9,350,000	$22,750,000	$267,000	$23,017,000
			Groundwater	WT01	$60,300	$64,500	$124,800	$1,440	$126,240
			Upland tailings - active facilities	C09	$16,300,000	$11,400,000	$27,700,000	$3,260,000	$30,960,000
	WAL002	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$603	$645	$1,248	$29	$1,277
			Floodplain waste rock	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL003	BLM Polygon	Upland waste rock	C02a	$277,000	$194,000	$471,000	$36,100	$507,100
	WAL004	BLM Polygon	Floodplain sediments	C01b	$1,560,000	$1,090,000	$2,650,000	$0	$2,650,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C08a	$2,100,000	$1,470,000	$3,570,000	$293,000	$3,863,000
				C14c	$25,200,000	$17,700,000	$42,900,000	$757,000	$43,657,000
				C15b	$7,710,000	$5,400,000	$13,110,000	$154,000	$13,264,000
				HAUL-2	$650,000	$455,000	$1,105,000	$0	$1,105,000
			Groundwater	WT01	$402,000	$430,000	$832,000	$47,400	$879,400
	WAL005	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	WAL014	BLM Polygon	Upland waste rock (erosion potential)	C01	$164,000	$115,000	$279,000	$0	$279,000
				C08a	$690,000	$483,000	$1,173,000	$96,600	$1,269,600
				HAUL-2	$214,000	$150,000	$364,000	$0	$364,000
	WAL016	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL017	BLM Polygon	Upland waste rock	C02a	$175,000	$122,000	$297,000	$22,700	$319,700
	WAL019	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	WAL020	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C01	$584,000	$409,000	$993,000	$0	$993,000
				C08a	$2,460,000	$1,720,000	$4,180,000	$344,000	$4,524,000
				HAUL-2	$763,000	$534,000	$1,297,000	$0	$1,297,000
	WAL021	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	WAL022	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	WAL023	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	WAL024	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL025	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	WAL026	BLM Polygon	Upland waste rock	C02a	$7,590	$5,310	$12,900	$986	$13,886
	WAL027	BLM Polygon	Upland waste rock	C02a	$76,700	$53,700	$130,400	$9,970	$140,370
	WAL028	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	WAL029	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	WAL034	BLM Polygon	Floodplain sediments	C01b	$1,030,000	$721,000	$1,751,000	$0	$1,751,000
				C08a	$1,380,000	$966,000	$2,346,000	$193,000	$2,539,000
				HAUL-2	$428,000	$300,000	$728,000	$0	$728,000
	WAL035	BLM Polygon	Floodplain waste rock	C01	$588,000	$412,000	$1,000,000	$0	$1,000,000
				C08a	$2,480,000	$1,730,000	$4,210,000	$347,000	$4,557,000
				HAUL-2	$769,000	$538,000	$1,307,000	$0	$1,307,000
	WAL036	BLM Polygon	Floodplain sediments	C01b	$594,000	$416,000	$1,010,000	$0	$1,010,000
				C08a	$797,000	$558,000	$1,355,000	$112,000	$1,467,000
				HAUL-2	$247,000	$173,000	$420,000	$0	$420,000
	WAL037	BLM Polygon	Upland tailings	C01	$50,400	$35,300	$85,700	$0	$85,700
				C08a	$212,000	$149,000	$361,000	$29,700	$390,700
				HAUL-2	$65,900	$46,100	$112,000	$0	$112,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	WAL046	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL047	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	WAL048	BLM Polygon	Upland waste rock	C02a	$102,000	$71,400	$173,400	$13,300	$186,700
	WAL049	BLM Polygon	Upland waste rock	C02a	$95,300	$66,700	$162,000	$12,400	$174,400
	WAL050	BLM Polygon	Upland waste rock	C02a	$70,800	$49,600	$120,400	$9,210	$129,610
	WAL051	BLM Polygon	Upland waste rock	C02a	$54,000	$37,800	$91,800	$7,010	$98,810
	WAL052	BLM Polygon	Upland waste rock	C02a	$70,800	$49,600	$120,400	$9,210	$129,610
	WAL053	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	WAL054	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	WAL055	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL056	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL057	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL058	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL059	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	WAL060	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	WAL061	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560
	WAL062	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL063	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	WAL064	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL065	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	WAL066	BLM Polygon	Upland waste rock	C02a	$27,800	$19,500	$47,300	$3,620	$50,920
	WAL067	BLM Polygon	Upland waste rock	C02a	$58,200	$40,700	$98,900	$7,560	$106,460
	WAL070	BLM Polygon	Upland waste rock	C02a	$59,900	$41,900	$101,800	$7,780	$109,580
	WAL071	BLM Polygon	Upland waste rock	C02a	$16,900	$11,800	$28,700	$2,190	$30,890
	WAL072	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL073	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL074	BLM Polygon	Upland waste rock	C02a	$21,900	$15,300	$37,200	$2,850	$40,050
MIDGradSeg02	KLW061	BLM Polygon	Upland waste rock	C02b	$2,320,000	$1,620,000	$3,940,000	$301,000	$4,241,000
	KLW062	BLM Polygon	Upland waste rock	C02b	$356,000	$249,000	$605,000	$46,200	$651,200
	KLW070	BLM Polygon	Floodplain sediments	C01b	$123,000	$86,400	$209,400	$0	$209,400
				C08a	$165,000	$116,000	$281,000	$23,200	$304,200
				HAUL-2	$51,300	$35,900	$87,200	$0	$87,200
	KLW071	BLM Polygon	Upland waste rock	C02b	$576,000	$403,000	$979,000	$74,900	$1,053,900
	KLW095	BLM Polygon	Upland waste rock	C02b	$137,000	$95,900	$232,900	$17,800	$250,700
	KLW123	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	KLW124	BLM Polygon	Upland waste rock	C02b	$61,800	$43,300	$105,100	$8,030	$113,130
	KLW125	BLM Polygon	Upland waste rock	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	KLW126	BLM Polygon	Upland waste rock	C02a	$21,900	$15,300	$37,200	$2,850	$40,050
	KLW127	BLM Polygon	Upland waste rock	C02b	$21,700	$15,200	$36,900	$2,820	$39,720
	KLW128	BLM Polygon	Upland waste rock	C02b	$212,000	$148,000	$360,000	$27,600	$387,600
	MAS070	BLM Polygon	Upland waste rock	C02a	$33,700	$23,600	$57,300	$4,380	$61,680
	MG02-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$15,100	$10,500	$25,600	$4,520	$30,120
				CD-AVG	$12,400	$8,650	$21,050	$3,710	$24,760
				FP/RP-AVG	$16,600	$11,600	$28,200	$2,980	$31,180
				VBS-AVG	$6,420	$4,500	$10,920	$1,930	$12,850
	MG02-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$13,300	$9,330	$22,630	$4,000	$26,630
				CD-AVG	$10,300	$7,210	$17,510	$3,090	$20,600
				FP/RP-AVG	$14,600	$10,200	$24,800	$2,630	$27,430
				VBS-AVG	$5,680	$3,980	$9,660	$1,700	$11,360
	MG02-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$9,410	$6,590	$16,000	$2,820	$18,820
				CD-AVG	$2,060	$1,440	$3,500	$618	$4,118
				FP/RP-AVG	$6,200	$4,340	$10,540	$1,120	$11,660
				VBS-AVG	$1,200	$842	$2,042	$361	$2,403
MoonCrkSeg01	KLE007	BLM Polygon	Upland waste rock	C02b	$104,000	$72,500	$176,500	$13,500	$190,000
	KLE061	BLM Polygon	Floodplain waste rock	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MC01-2	Bioengineering Reach	BioReach Current Deflector Frequency	CD-SED	$7,480	$5,240	$12,720	$44,900	$57,620
			BioReach General Characteristics	BSBR-AVG	$187,000	$131,000	$318,000	$56,000	$374,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				FP/RP-AVG	$154,000	$108,000	$262,000	$27,700	$289,700
				VBS-AVG	$79,600	$55,700	$135,300	$23,900	$159,200
MoonCrkSeg02	KLE008	BLM Polygon	Upland waste rock (erosion potential)	C02b	$109,000	$76,000	$185,000	$14,100	$199,100
	KLE009	BLM Polygon	Upland waste rock	C02a	$116,000	$81,400	$197,400	$15,100	$212,500
	KLE013	BLM Polygon	Upland waste rock	C02b	$88,500	$62,000	$150,500	$11,500	$162,000
	KLE014	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	KLE041	BLM Polygon	Floodplain sediments	C01b	$43,600	$30,500	$74,100	$0	$74,100
				C08a	$58,400	$40,900	$99,300	$8,180	$107,480
				HAUL-2	$18,100	$12,700	$30,800	$0	$30,800
	KLE063	BLM Polygon	Upland waste rock (erosion potential)	C02b	$25,100	$17,500	$42,600	$3,260	$45,860
	KLE064	BLM Polygon	Upland waste rock (erosion potential)	C02b	$21,700	$15,200	$36,900	$2,820	$39,720
	KLE065	BLM Polygon	Upland waste rock (erosion potential)	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MC02-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$163,000	$114,000	$277,000	$48,800	$325,800
				CD-AVG	$138,000	$96,600	$234,600	$41,400	$276,000
				FP/RP-AVG	$447,000	$313,000	$760,000	$80,500	$840,500
				VBS-AVG	$69,400	$48,600	$118,000	$20,800	$138,800
	MC02-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$136,000	$95,400	$231,400	$40,900	$272,300
				CD-AVG	$57,700	$40,400	$98,100	$17,300	$115,400
				FP/RP-AVG	$225,000	$157,000	$382,000	$40,400	$422,400
				VBS-AVG	$58,100	$40,700	$98,800	$17,400	$116,200
	MC02-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$70,800	$49,500	$120,300	$21,200	$141,500
				CD-AVG	$59,700	$41,800	$101,500	$17,900	$119,400
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900
				VBS-AVG	$45,200	$31,600	$76,800	$13,600	$90,400
NMSeg	PIPENM	General Feature	Source General Information	PIPE-1	$1,560,000	$1,090,000	$2,650,000	$125,000	$2,775,000
NMSeg01	BUR051	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$153,000	$107,000	$260,000	$19,800	$279,800
	BUR052	BLM Polygon	Upland waste rock	C01	$16,800	$11,800	$28,600	$0	$28,600
	BUR052	BLM Polygon	Upland waste rock	C07	$58,800	$41,200	$100,000	$12,900	$112,900
	BUR053	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$423,000	$296,000	$719,000	$1,130,000	$1,849,000
			Upland waste rock (erosion potential)	C01	$2,910,000	$2,030,000	$4,940,000	$0	$4,940,000
				C07	$10,200,000	$7,120,000	$17,320,000	$2,240,000	$19,560,000
	BUR077	BLM Polygon	Upland waste rock	C02a	$96,100	$67,300	$163,400	$12,500	$175,900
	BUR081	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$51,400	$36,000	$87,400	$6,680	$94,080
	BUR082	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	BUR083	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	BUR084	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	BUR140	BLM Polygon	Floodplain sediments	C01b	$132,000	$92,400	$224,400	$0	$224,400
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
	NM01-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$489,000	$343,000	$832,000	$147,000	$979,000
				CD-AVG	$82,400	$57,700	$140,100	$24,700	$164,800

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				FP/RP-AVG	$269,000	$188,000	$457,000	$48,400	$505,400
				VBS-AVG	$209,000	$146,000	$355,000	$62,600	$417,600
NMSeg02	BUR054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$211,000	$148,000	$359,000	$549,000	$908,000
			Upland tailings - inactive facilities	C01	$945,000	$662,000	$1,607,000	$0	$1,607,000
				C08a	$3,980,000	$2,790,000	$6,770,000	$558,000	$7,328,000
				HAUL-2	$1,240,000	$865,000	$2,105,000	$0	$2,105,000
			Upland waste rock (potential intermixed tailings)	C01	$315,000	$221,000	$536,000	$0	$536,000
				C08a	$1,330,000	$929,000	$2,259,000	$186,000	$2,445,000
				HAUL-2	$412,000	$288,000	$700,000	$0	$700,000
	BUR055	BLM Polygon	Floodplain sediments	C01b	$72,600	$50,800	$123,400	$0	$123,400
				C08a	$97,400	$68,100	$165,500	$13,600	$179,100
				HAUL-2	$30,200	$21,100	$51,300	$0	$51,300
			Upland tailings	C01	$58,800	$41,200	$100,000	$0	$100,000
				C08a	$248,000	$173,000	$421,000	$34,700	$455,700
				HAUL-2	$76,900	$53,800	$130,700	$0	$130,700
	BUR056	BLM Polygon	Upland waste rock (potential intermixed tailings)	C01	$1,230,000	$861,000	$2,091,000	$0	$2,091,000
				C08a	$5,190,000	$3,630,000	$8,820,000	$726,000	$9,546,000
				HAUL-2	$1,610,000	$1,130,000	$2,740,000	$0	$2,740,000
	BUR057	BLM Polygon	Upland waste rock	C02a	$76,700	$53,700	$130,400	$9,970	$140,370
	BUR058	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$81,800	$57,200	$139,000	$10,600	$149,600
	BUR059	BLM Polygon	Upland waste rock	C02a	$147,000	$103,000	$250,000	$19,100	$269,100
	BUR060	BLM Polygon	Upland waste rock	C02a	$180,000	$126,000	$306,000	$23,500	$329,500
	BUR061	BLM Polygon	Upland waste rock	C02a	$120,000	$83,800	$203,800	$15,600	$219,400
	BUR062	BLM Polygon	Upland waste rock	C02a	$57,300	$40,100	$97,400	$7,450	$104,850
	BUR170	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$453,000	$317,000	$770,000	$1,160,000	$1,930,000
			Upland waste rock (potential intermixed tailings)	C01	$46,200	$32,300	$78,500	$0	$78,500
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
	BUR171	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$330,000	$231,000	$561,000	$1,060,000	$1,621,000
	BUR196	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	BUR197	BLM Polygon	Upland waste rock	C02a	$38,800	$27,100	$65,900	$5,040	$70,940
	BUR205	BLM Polygon	Upland waste rock	C02a	$54,800	$38,400	$93,200	$7,120	$100,320
NM02-1	Bioengineering Reach		BioReach General Characteristics	BSBR-AVG	$921,000	$645,000	$1,566,000	$276,000	$1,842,000
				CD-AVG	$157,000	$110,000	$267,000	$47,000	$314,000
				FP/RP-AVG	$506,000	$354,000	$860,000	$91,100	$951,100
				OFFCH-AVG	$15,600	$10,900	$26,500	$2,810	$29,310
				VBS-AVG	$393,000	$275,000	$668,000	$118,000	$786,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	OSB040	BLM Polygon	Floodplain sediments	C01b	$251,000	$176,000	$427,000	$0	$427,000
				C08a	$336,000	$235,000	$571,000	$47,100	$618,100
				HAUL-2	$104,000	$73,000	$177,000	$0	$177,000
	OSB044	BLM Polygon	Floodplain sediments	C01b	$132,000	$92,400	$224,400	$0	$224,400
				C08a	$177,000	$124,000	$301,000	$24,800	$325,800
				HAUL-2	$54,900	$38,400	$93,300	$0	$93,300
			Upland tailings (jig tailings)	C01	$1,510,000	$1,060,000	$2,570,000	$0	$2,570,000
				C08a	$6,370,000	$4,460,000	$10,830,000	$892,000	$11,722,000
				HAUL-2	$1,980,000	$1,380,000	$3,360,000	$0	$3,360,000
			Upland waste rock	C01	$71,400	$50,000	$121,400	$0	$121,400
				C08a	$301,000	$211,000	$512,000	$42,100	$554,100
				HAUL-2	$93,300	$65,300	$158,600	$0	$158,600
	OSB045	BLM Polygon	Upland waste rock	C02a	$70,800	$49,600	$120,400	$9,210	$129,610
	OSB046	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	OSB048	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	OSB056	BLM Polygon	Floodplain sediments	C01b	$21,100	$14,800	$35,900	$0	$35,900
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB057	BLM Polygon	Floodplain sediments	C01b	$172,000	$120,000	$292,000	$0	$292,000
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	OSB058	BLM Polygon	Floodplain sediments	C01b	$21,100	$14,800	$35,900	$0	$35,900
				C08a	$28,300	$19,800	$48,100	$3,960	$52,060
				HAUL-2	$8,780	$6,150	$14,930	$0	$14,930
	OSB088	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$3,920	$4,200	$8,120	$233	$8,353
	OSB089	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$10,600	$11,300	$21,900	$682	$22,582
NMSeg03	NM03-1	Bioengineering Reach	BioReach General Characteristics	CD-AVG	$76,200	$53,400	$129,600	$22,900	$152,500
				FP/RP-AVG	$621,000	$434,000	$1,055,000	$112,000	$1,167,000
				OFFCH-AVG	$56,000	$39,200	$95,200	$10,100	$105,300
				VBS-AVG	$241,000	$169,000	$410,000	$72,300	$482,300
	OSB041	BLM Polygon	Upland waste rock	C02a	$69,100	$48,400	$117,500	$8,990	$126,490
	OSB042	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	OSB043	BLM Polygon	Upland waste rock	C02a	$113,000	$79,100	$192,100	$14,700	$206,800
	OSB049	BLM Polygon	Upland waste rock	C02a	$46,400	$32,500	$78,900	$6,030	$84,930
	OSB081	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	OSB087	BLM Polygon	Upland waste rock	C02a	$8,430	$5,900	$14,330	$1,100	$15,430
NMSeg04	NM04-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$252,000	$177,000	$429,000	$75,700	$504,700
				CD-AVG	$43,300	$30,300	$73,600	$13,000	$86,600
				CH REAL-1	$1,160,000	$815,000	$1,975,000	$198,000	$2,173,000
				FP/RP-AVG	$194,000	$136,000	$330,000	$34,900	$364,900

TABLE D-38
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				OFFCH-AVG	$101,000	$70,800	$171,800	$18,200	$190,000
				VBS-AVG	$108,000	$75,300	$183,300	$32,300	$215,600
	NM04-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$87,500	$61,200	$148,700	$26,200	$174,900
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				CH REAL-1	$404,000	$282,000	$686,000	$68,600	$754,600
				FP/RP-AVG	$192,000	$135,000	$327,000	$34,600	$361,600
				VBS-AVG	$37,300	$26,100	$63,400	$11,200	$74,600
	NM04-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$677,000	$474,000	$1,151,000	$203,000	$1,354,000
				CD-AVG	$115,000	$80,800	$195,800	$34,600	$230,400
				CH REAL-1	$3,120,000	$2,190,000	$5,310,000	$531,000	$5,841,000
				FP/RP-AVG	$893,000	$625,000	$1,518,000	$161,000	$1,679,000
				VBS-AVG	$289,000	$202,000	$491,000	$86,600	$577,600
	OSB031	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340
	OSB032	BLM Polygon	Floodplain waste rock	C01	$84,000	$58,800	$142,800	$0	$142,800
				C08a	$354,000	$248,000	$602,000	$49,600	$651,600
				HAUL-2	$110,000	$76,900	$186,900	$0	$186,900
	OSB033	BLM Polygon	Upland waste rock (erosion potential)	C01	$67,200	$47,000	$114,200	$0	$114,200
				C08a	$283,000	$198,000	$481,000	$39,600	$520,600
				HAUL-2	$87,800	$61,500	$149,300	$0	$149,300
	OSB034	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	OSB035	BLM Polygon	Upland waste rock	C02a	$41,300	$28,900	$70,200	$5,370	$75,570
	OSB036	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	OSB037	BLM Polygon	Upland waste rock	C02a	$59,900	$41,900	$101,800	$7,780	$109,580
	OSB038	BLM Polygon	Floodplain waste rock	C01	$130,000	$91,100	$221,100	$0	$221,100
				C08a	$549,000	$384,000	$933,000	$76,800	$1,009,800
				HAUL-2	$170,000	$119,000	$289,000	$0	$289,000
	OSB039	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,100	$4,390	$8,490	$244	$8,734
			Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Floodplain sediments	C01b	$290,000	$203,000	$493,000	$0	$493,000
				C08a	$389,000	$273,000	$662,000	$54,500	$716,500
				HAUL-2	$121,000	$84,500	$205,500	$0	$205,500
			Upland tailings	C01	$46,200	$32,300	$78,500	$0	$78,500
				C08a	$195,000	$136,000	$331,000	$27,300	$358,300
				HAUL-2	$60,400	$42,300	$102,700	$0	$102,700
			Upland waste rock	C02a	$991,000	$694,000	$1,685,000	$129,000	$1,814,000
	OSB052	BLM Polygon	Upland tailings - inactive facilities	C01	$840,000	$588,000	$1,428,000	$0	$1,428,000
				C08a	$3,540,000	$2,480,000	$6,020,000	$496,000	$6,516,000
				HAUL-2	$1,100,000	$769,000	$1,869,000	$0	$1,869,000
	OSB055	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$4,040	$4,320	$8,360	$241	$8,601
			Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	OSB059	BLM Polygon	Floodplain sediments	C01b	$436,000	$305,000	$741,000	$0	$741,000
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	OSB060	BLM Polygon	Floodplain sediments	C01b	$10,600	$7,390	$17,990	$0	$17,990
				C08a	$14,200	$9,910	$24,110	$1,980	$26,090
				HAUL-2	$4,390	$3,070	$7,460	$0	$7,460
	OSB061	BLM Polygon	Upland tailings	C01	$29,400	$20,600	$50,000	$0	$50,000
				C08a	$124,000	$86,700	$210,700	$17,300	$228,000
				HAUL-2	$38,400	$26,900	$65,300	$0	$65,300
	OSB082	BLM Polygon	Floodplain waste rock	C01	$54,600	$38,200	$92,800	$0	$92,800
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	OSB083	BLM Polygon	Upland waste rock	C02a	$64,900	$45,400	$110,300	$8,440	$118,740
	OSB114	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	OSB115	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	OSB116	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	WAL006	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	WAL033	BLM Polygon	Floodplain sediments	C01b	$449,000	$314,000	$763,000	$0	$763,000
				C08a	$602,000	$421,000	$1,023,000	$84,300	$1,107,300
				HAUL-2	$187,000	$131,000	$318,000	$0	$318,000
	WAL069	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	WAL075	BLM Polygon	Upland waste rock	C02a	$7,590	$5,310	$12,900	$986	$13,886
	WAL078	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
PineCrkSeg01	MAS004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$322,000	$225,000	$547,000	$1,050,000	$1,597,000
			Upland waste rock	C02a	$71,700	$50,200	$121,900	$9,320	$131,220
	MAS005	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	MAS006	BLM Polygon	Floodplain tailings - inactive Facilities	C01	$176,000	$123,000	$299,000	$0	$299,000
				C08a	$743,000	$520,000	$1,263,000	$104,000	$1,367,000
				HAUL-2	$231,000	$161,000	$392,000	$0	$392,000
	MAS007	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$346,000	$242,000	$588,000	$1,100,000	$1,688,000
			Upland waste rock	C01	$202,000	$141,000	$343,000	$0	$343,000
				C08a	$850,000	$595,000	$1,445,000	$119,000	$1,564,000
				HAUL-2	$264,000	$184,000	$448,000	$0	$448,000
	MAS008	BLM Polygon	Upland waste rock (erosion potential)	C01	$105,000	$73,500	$178,500	$0	$178,500
				C08a	$443,000	$310,000	$753,000	$62,000	$815,000
				HAUL-2	$137,000	$96,100	$233,100	$0	$233,100

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MAS009	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$135,000	$94,400	$229,400	$527,000	$756,400
			Upland waste rock (erosion potential)	C01	$31,200	$21,900	$53,100	$0	$53,100
				C08a	$132,000	$92,200	$224,200	$18,400	$242,600
				HAUL-2	$40,800	$28,600	$69,400	$0	$69,400
	MAS011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$136,000	$95,300	$231,300	$527,000	$758,300
	MAS012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$2,100	$1,470	$3,570	$0	$3,570
				C08a	$8,850	$6,200	$15,050	$1,240	$16,290
				HAUL-2	$2,750	$1,920	$4,670	$0	$4,670
	MAS013	BLM Polygon	Upland waste rock (erosion potential)	C01	$19,700	$13,800	$33,500	$0	$33,500
				C08a	$83,200	$58,200	$141,400	$11,600	$153,000
				HAUL-2	$25,800	$18,100	$43,900	$0	$43,900
	MAS014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Seep	WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland tailings	C01	$336	$235	$571	$0	$571
				C08a	$1,420	$991	$2,411	$198	$2,609
				HAUL-2	$439	$307	$746	$0	$746
	MAS015	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$267,000	$187,000	$454,000	$1,000,000	$1,454,000
			Upland waste rock (erosion potential)	C01	$4,200	$2,940	$7,140	$0	$7,140
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330
	MAS016	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$135,000	$94,400	$229,400	$527,000	$756,400
			Upland waste rock (erosion potential)	C01	$97,800	$68,400	$166,200	$0	$166,200
				C08a	$412,000	$288,000	$700,000	$57,700	$757,700
				HAUL-2	$128,000	$89,500	$217,500	$0	$217,500
	MAS017	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock (erosion potential)	C01	$263,000	$184,000	$447,000	$0	$447,000
				C08a	$1,110,000	$776,000	$1,886,000	$155,000	$2,041,000
				HAUL-2	$344,000	$241,000	$585,000	$0	$585,000
	MAS018	BLM Polygon	Upland waste rock (erosion potential)	C01	$11,300	$7,940	$19,240	$0	$19,240
				C08a	$47,800	$33,500	$81,300	$6,690	$87,990
				HAUL-2	$14,800	$10,400	$25,200	$0	$25,200
	MAS019	BLM Polygon	Floodplain waste rock	C01	$4,200	$2,940	$7,140	$0	$7,140
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MAS020	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$363,000	$254,000	$617,000	$1,030,000	$1,647,000
	MAS021	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$389,000	$272,000	$661,000	$1,140,000	$1,801,000
			Upland waste rock (erosion potential)	C01	$4,200	$2,940	$7,140	$0	$7,140
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330
	MAS022	BLM Polygon	Floodplain waste rock	C01	$202,000	$141,000	$343,000	$0	$343,000
				C08a	$850,000	$595,000	$1,445,000	$119,000	$1,564,000
				HAUL-2	$264,000	$184,000	$448,000	$0	$448,000
	MAS023	BLM Polygon	Upland waste rock (erosion potential)	C01	$4,200	$2,940	$7,140	$0	$7,140
				C08a	$17,700	$12,400	$30,100	$2,480	$32,580
				HAUL-2	$5,490	$3,840	$9,330	$0	$9,330
	MAS025	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
	MAS027	BLM Polygon	Floodplain waste rock	C01	$29,400	$20,600	$50,000	$0	$50,000
				C08a	$124,000	$86,700	$210,700	$17,300	$228,000
				HAUL-2	$38,400	$26,900	$65,300	$0	$65,300
	MAS028	BLM Polygon	Upland waste rock (erosion potential)	C01	$45,400	$31,800	$77,200	$0	$77,200
				C08a	$191,000	$134,000	$325,000	$26,800	$351,800
				HAUL-2	$59,300	$41,500	$100,800	$0	$100,800
	MAS029	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$139,000	$97,000	$236,000	$528,000	$764,000
			Upland waste rock (intermixed tailings)	C01	$2,940	$2,060	$5,000	$0	$5,000
				C08a	$12,400	$8,670	$21,070	$1,730	$22,800
				HAUL-2	$3,840	$2,690	$6,530	$0	$6,530
	MAS030	BLM Polygon	Upland waste rock (erosion potential)	C01	$28,200	$19,800	$48,000	$0	$48,000
				C08a	$119,000	$83,300	$202,300	$16,700	$219,000
				HAUL-2	$36,900	$25,800	$62,700	$0	$62,700
	MAS031	BLM Polygon	Upland waste rock (erosion potential)	C01	$18,100	$12,700	$30,800	$0	$30,800
				C08a	$76,500	$53,500	$130,000	$10,700	$140,700
				HAUL-2	$23,700	$16,600	$40,300	$0	$40,300
	MAS032	BLM Polygon	Upland waste rock (erosion potential)	C01	$336	$235	$571	$0	$571
				C08a	$1,420	$991	$2,411	$198	$2,609
				HAUL-2	$439	$307	$746	$0	$746
	MAS033	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,200	$14,100	$34,300	$0	$34,300
				C08a	$85,000	$59,500	$144,500	$11,900	$156,400
				HAUL-2	$26,400	$18,400	$44,800	$0	$44,800
	MAS034	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MAS035	BLM Polygon	Upland waste rock (erosion potential)	C01	$33,600	$23,500	$57,100	$0	$57,100
				C08a	$142,000	$99,100	$241,100	$19,800	$260,900
				HAUL-2	$43,900	$30,700	$74,600	$0	$74,600

TABLE D-38
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MAS036	BLM Polygon	Floodplain tailings	C01	$11,300	$7,940	$19,240	$0	$19,240
				C08a	$47,800	$33,500	$81,300	$6,690	$87,990
				HAUL-2	$14,800	$10,400	$25,200	$0	$25,200
	MAS040	BLM Polygon	Floodplain sediments	C01b	$18,200	$12,800	$31,000	$0	$31,000
				C08a	$24,400	$17,100	$41,500	$3,420	$44,920
				HAUL-2	$7,580	$5,300	$12,880	$0	$12,880
	MAS041	BLM Polygon	Floodplain sediments	C01b	$30,900	$21,600	$52,500	$0	$52,500
				C08a	$41,400	$29,000	$70,400	$5,800	$76,200
				HAUL-2	$12,800	$8,990	$21,790	$0	$21,790
	MAS042	BLM Polygon	Floodplain sediments	C01b	$14,300	$9,980	$24,280	$0	$24,280
				C08a	$19,100	$13,400	$32,500	$2,680	$35,180
				HAUL-2	$5,930	$4,150	$10,080	$0	$10,080
	MAS043	BLM Polygon	Floodplain sediments	C01b	$39,600	$27,700	$67,300	$0	$67,300
				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000
	MAS045	BLM Polygon	Floodplain sediments	C01b	$39,600	$27,700	$67,300	$0	$67,300
				C08a	$53,100	$37,200	$90,300	$7,430	$97,730
				HAUL-2	$16,500	$11,500	$28,000	$0	$28,000
	MAS046	BLM Polygon	Floodplain sediments	C01b	$315,000	$220,000	$535,000	$0	$535,000
				C08a	$422,000	$296,000	$718,000	$59,100	$777,100
				HAUL-2	$131,000	$91,700	$222,700	$0	$222,700
	MAS048	BLM Polygon	Floodplain tailings	C01	$20,800	$14,600	$35,400	$0	$35,400
				C08a	$87,600	$61,300	$148,900	$12,300	$161,200
				HAUL-2	$27,200	$19,000	$46,200	$0	$46,200
			Upland tailings	C01	$68,500	$48,000	$116,500	$0	$116,500
				C08a	$289,000	$202,000	$491,000	$40,400	$531,400
				HAUL-2	$89,600	$62,700	$152,300	$0	$152,300
	MAS049	BLM Polygon	Floodplain tailings	C01	$151,000	$106,000	$257,000	$0	$257,000
				C08a	$637,000	$446,000	$1,083,000	$89,200	$1,172,200
				HAUL-2	$198,000	$138,000	$336,000	$0	$336,000
	MAS050	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$374,000	$261,000	$635,000	$1,150,000	$1,785,000
			Floodplain waste rock (intermixed tailings)	C01	$89,900	$62,900	$152,800	$0	$152,800
				C08a	$379,000	$265,000	$644,000	$53,000	$697,000
				HAUL-2	$117,000	$82,200	$199,200	$0	$199,200
	MAS051	BLM Polygon	Upland waste rock	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MAS052	BLM Polygon	Upland waste rock (erosion potential)	C01	$22,200	$15,500	$37,700	$0	$37,700
				C08a	$93,500	$65,400	$158,900	$13,100	$172,000
				HAUL-2	$29,000	$20,300	$49,300	$0	$49,300
	MAS053	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869

TABLE D-38
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MAS054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$184,000	$129,000	$313,000	$538,000	$851,000
			Floodplain waste rock	C01	$44,400	$31,000	$75,400	$0	$75,400
				C08a	$187,000	$131,000	$318,000	$26,200	$344,200
				HAUL-2	$58,000	$40,600	$98,600	$0	$98,600
	MAS055	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS056	BLM Polygon	Upland waste rock	C02b	$31,700	$22,200	$53,900	$4,120	$58,020
	MAS057	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS058	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MAS059	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MAS060	BLM Polygon	Upland waste rock	C02b	$45,100	$31,600	$76,700	$5,860	$82,560
	MAS061	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	MAS062	BLM Polygon	Upland waste rock	C02b	$38,400	$26,900	$65,300	$4,990	$70,290
	MAS063	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MAS065	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS067	BLM Polygon	Seep	WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MAS068	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS069	BLM Polygon	Upland waste rock	C02a	$159,000	$112,000	$271,000	$20,700	$291,700
	MAS072	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	MAS075	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MAS076	BLM Polygon	Upland waste rock	C02a	$37,900	$26,600	$64,500	$4,930	$69,430
	MAS077	BLM Polygon	Upland waste rock	C02a	$91,900	$64,300	$156,200	$11,900	$168,100
	MAS078	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$354,000	$247,000	$601,000	$578,000	$1,179,000
	MAS079	BLM Polygon	Floodplain waste rock	C01	$157,000	$110,000	$267,000	$0	$267,000
				C08a	$660,000	$462,000	$1,122,000	$92,400	$1,214,400
				HAUL-2	$205,000	$143,000	$348,000	$0	$348,000
	MAS080	BLM Polygon	Upland waste rock	C02a	$36,200	$25,400	$61,600	$4,710	$66,310
	MAS082	BLM Polygon	Upland waste rock	C02b	$104,000	$72,500	$176,500	$13,500	$190,000
	MAS083	BLM Polygon	Upland tailings	C01	$34,200	$24,000	$58,200	$0	$58,200
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				HAUL-2	$44,700	$31,300	$76,000	$0	$76,000
			Upland waste rock	C01	$122,000	$85,300	$207,300	$0	$207,300
				C08a	$513,000	$359,000	$872,000	$71,900	$943,900
				HAUL-2	$159,000	$111,000	$270,000	$0	$270,000
	MAS084	BLM Polygon	Floodplain tailings	C01	$126,000	$88,200	$214,200	$0	$214,200
				C08a	$531,000	$372,000	$903,000	$74,300	$977,300
				HAUL-2	$165,000	$115,000	$280,000	$0	$280,000
PineCrkSeg02	TWI001	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340
	TWI002	BLM Polygon	Floodplain waste rock	C01	$24,200	$16,900	$41,100	$0	$41,100
				C08a	$102,000	$71,400	$173,400	$14,300	$187,700
				HAUL-2	$31,600	$22,100	$53,700	$0	$53,700
	TWI003	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	TWI004	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	TWI005	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	TWI006	BLM Polygon	Upland waste rock (erosion potential)	C01	$20,200	$14,100	$34,300	$0	$34,300
				C08a	$85,000	$59,500	$144,500	$11,900	$156,400
				HAUL-2	$26,400	$18,400	$44,800	$0	$44,800
	TWI007	BLM Polygon	Upland waste rock	C02b	$41,800	$29,200	$71,000	$5,430	$76,430
	TWI008	BLM Polygon	Floodplain waste rock	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI009	BLM Polygon	Floodplain waste rock	C01	$27,200	$19,100	$46,300	$0	$46,300
				C08a	$115,000	$80,300	$195,300	$16,100	$211,400
				HAUL-2	$35,600	$24,900	$60,500	$0	$60,500
	TWI010	BLM Polygon	Upland waste rock	C02b	$55,100	$38,600	$93,700	$7,160	$100,860
	TWI011	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI012	BLM Polygon	Floodplain waste rock	C01	$16,100	$11,300	$27,400	$0	$27,400
				C08a	$68,000	$47,600	$115,600	$9,520	$125,120
				HAUL-2	$21,100	$14,800	$35,900	$0	$35,900
	TWI013	BLM Polygon	Upland waste rock	C01	$32,300	$22,600	$54,900	$0	$54,900
				C08a	$136,000	$95,200	$231,200	$19,000	$250,200
				HAUL-2	$42,200	$29,500	$71,700	$0	$71,700
	TWI014	BLM Polygon	Floodplain waste rock	C01	$25,200	$17,600	$42,800	$0	$42,800
				C08a	$106,000	$74,300	$180,300	$14,900	$195,200
				HAUL-2	$32,900	$23,100	$56,000	$0	$56,000
	TWI015	BLM Polygon	Upland waste rock	C02b	$53,400	$37,400	$90,800	$6,950	$97,750
	TWI016	BLM Polygon	Upland waste rock	C02b	$41,800	$29,200	$71,000	$5,430	$76,430
	TWI017	BLM Polygon	Upland waste rock	C02a	$22,800	$15,900	$38,700	$2,960	$41,660
	TWI018	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516

TABLE D-38
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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI019	BLM Polygon	Upland waste rock	C02b	$55,100	$38,600	$93,700	$7,160	$100,860
	TWI020	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI021	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	TWI022	BLM Polygon	Upland waste rock	C02a	$61,500	$43,100	$104,600	$8,000	$112,600
	TWI023	BLM Polygon	Upland waste rock	C02a	$42,200	$29,500	$71,700	$5,480	$77,180
	TWI024	BLM Polygon	Upland waste rock	C02a	$35,400	$24,800	$60,200	$4,600	$64,800
	TWI025	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	TWI026	BLM Polygon	Upland waste rock	C02a	$116,000	$81,400	$197,400	$15,100	$212,500
	TWI027	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI028	BLM Polygon	Upland waste rock	C02b	$30,100	$21,000	$51,100	$3,910	$55,010
	TWI029	BLM Polygon	Upland waste rock	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	TWI030	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
PineCrkSeg03	KLW072	BLM Polygon	Upland waste rock	C02a	$87,700	$61,400	$149,100	$11,400	$160,500
	KLW073	BLM Polygon	Upland waste rock	C01	$35,300	$24,700	$60,000	$0	$60,000
				C08a	$149,000	$104,000	$253,000	$20,800	$273,800
				HAUL-2	$46,100	$32,300	$78,400	$0	$78,400
	KLW075	BLM Polygon	Floodplain waste rock	C01	$71,600	$50,100	$121,700	$0	$121,700
				C08a	$302,000	$211,000	$513,000	$42,200	$555,200
				HAUL-2	$93,500	$65,500	$159,000	$0	$159,000
	KLW077	BLM Polygon	Floodplain waste rock	C01	$46,400	$32,500	$78,900	$0	$78,900
				C08a	$195,000	$137,000	$332,000	$27,400	$359,400
				HAUL-2	$60,600	$42,400	$103,000	$0	$103,000
	KLW079	BLM Polygon	Floodplain waste rock	C01	$40,300	$28,200	$68,500	$0	$68,500
				C08a	$170,000	$119,000	$289,000	$23,800	$312,800
				HAUL-2	$52,700	$36,900	$89,600	$0	$89,600
	KLW081	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$156,000	$109,000	$265,000	$532,000	$797,000
	KLW082	BLM Polygon	Floodplain waste rock	C01	$34,300	$24,000	$58,300	$0	$58,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	KLW083	BLM Polygon	Floodplain waste rock	C01	$58,500	$40,900	$99,400	$0	$99,400
				C08a	$246,000	$172,000	$418,000	$34,500	$452,500
				HAUL-2	$76,400	$53,500	$129,900	$0	$129,900

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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	KLW084	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	KLW085	BLM Polygon	Floodplain waste rock	C01	$60,500	$42,300	$102,800	$0	$102,800
				C08a	$255,000	$178,000	$433,000	$35,700	$468,700
				HAUL-2	$79,100	$55,300	$134,400	$0	$134,400
	MAS001	BLM Polygon	Upland waste rock	C02a	$91,000	$63,700	$154,700	$11,800	$166,500
	MAS003	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$266,000	$186,000	$452,000	$1,010,000	$1,462,000
			Upland waste rock (intermixed tailings)	C06	$314,000	$220,000	$534,000	$72,200	$606,200
	MAS064	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MAS066	BLM Polygon	Upland waste rock	C01	$840	$588	$1,428	$0	$1,428
				C08a	$3,540	$2,480	$6,020	$496	$6,516
				HAUL-2	$1,100	$769	$1,869	$0	$1,869
	PC03-1	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$248,000	$174,000	$422,000	$74,400	$496,400
				CD-AVG	$84,500	$59,100	$143,600	$25,300	$168,900
				FP/RP-AVG	$313,000	$219,000	$532,000	$56,300	$588,300
				OFFCH-AVG	$792,000	$554,000	$1,346,000	$143,000	$1,489,000
				VBS-AVG	$106,000	$74,000	$180,000	$31,700	$211,700
	PC03-2	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$201,000	$141,000	$342,000	$60,400	$402,400
				CD-AVG	$45,300	$31,700	$77,000	$13,600	$90,600
				FP/RP-AVG	$265,000	$186,000	$451,000	$47,800	$498,800
				OFFCH-AVG	$679,000	$475,000	$1,154,000	$122,000	$1,276,000
				VBS-AVG	$85,700	$60,000	$145,700	$25,700	$171,400
	PC03-3	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$122,000	$85,400	$207,400	$36,600	$244,000
				CD-AVG	$20,600	$14,400	$35,000	$6,180	$41,180
				FP/RP-AVG	$381,000	$267,000	$648,000	$68,600	$716,600
				VBS-AVG	$52,000	$36,400	$88,400	$15,600	$104,000
UpperSFCDRSeg	PIPEUG	General Feature	Source General Information	PIPE-1	$332,000	$232,000	$564,000	$26,600	$590,600
				PIPE-2	$12,900	$9,050	$21,950	$1,030	$22,980
				PIPE-3	$6,420,000	$4,490,000	$10,910,000	$513,000	$11,423,000
				PIPE-4	$5,080,000	$3,560,000	$8,640,000	$406,000	$9,046,000
UpperSFCDRSeg01	BUR136	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	BUR137	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	LOK001	BLM Polygon	Upland waste rock (erosion potential)	C02a	$109,000	$76,100	$185,100	$14,100	$199,200
	LOK002	BLM Polygon	Upland waste rock (erosion potential)	C02a	$107,000	$74,900	$181,900	$13,900	$195,800
	LOK003	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	LOK004	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$521,000	$365,000	$886,000	$1,210,000	$2,096,000
			Floodplain waste rock	C01	$257,000	$180,000	$437,000	$0	$437,000
				C08a	$1,080,000	$758,000	$1,838,000	$152,000	$1,990,000
				HAUL-2	$336,000	$235,000	$571,000	$0	$571,000
	LOK005	BLM Polygon	Upland waste rock (erosion potential)	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	LOK006	BLM Polygon	Floodplain waste rock	C01	$26,200	$18,300	$44,500	$0	$44,500

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Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				C08a	$110,000	$77,300	$187,300	$15,500	$202,800
				HAUL-2	$34,300	$24,000	$58,300	$0	$58,300
	LOK007	BLM Polygon	Upland waste rock (erosion potential)	C01	$27,200	$19,100	$46,300	$0	$46,300
				C07	$95,300	$66,700	$162,000	$21,000	$183,000
	LOK008	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Floodplain waste rock	C01	$38,300	$26,800	$65,100	$0	$65,100
				C07	$134,000	$93,800	$227,800	$29,500	$257,300
	LOK009	BLM Polygon	Floodplain waste rock	C01	$92,700	$64,900	$157,600	$0	$157,600
				C07	$325,000	$227,000	$552,000	$71,400	$623,400
	LOK010	BLM Polygon	Floodplain waste rock	C01	$14,100	$9,880	$23,980	$0	$23,980
				C08a	$59,500	$41,600	$101,100	$8,330	$109,430
				HAUL-2	$18,400	$12,900	$31,300	$0	$31,300
	LOK011	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$3,620,000	$3,870,000	$7,490,000	$206,000	$7,696,000
			Floodplain waste rock	C01	$231,000	$162,000	$393,000	$0	$393,000
				C07	$809,000	$566,000	$1,375,000	$178,000	$1,553,000
	LOK012	BLM Polygon	Upland waste rock	C02a	$122,000	$85,600	$207,600	$15,900	$223,500
	LOK013	BLM Polygon	Upland waste rock	C02a	$108,000	$75,500	$183,500	$14,000	$197,500
	LOK014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$40,500	$28,300	$68,800	$5,260	$74,060
	LOK015	BLM Polygon	Upland waste rock	C02a	$10,100	$7,080	$17,180	$1,320	$18,500
	LOK016	BLM Polygon	Upland waste rock	C02a	$69,100	$48,400	$117,500	$8,990	$126,490
	LOK017	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$159,000	$111,000	$270,000	$532,000	$802,000
			Floodplain waste rock	C01	$130,000	$91,100	$221,100	$0	$221,100
				C08a	$549,000	$384,000	$933,000	$76,800	$1,009,800
				HAUL-2	$170,000	$119,000	$289,000	$0	$289,000
	LOK018	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340
	LOK019	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$134,000	$93,900	$227,900	$527,000	$754,900
			Upland waste rock	C02b	$110,000	$77,200	$187,200	$14,300	$201,500
	LOK020	BLM Polygon	Upland waste rock	C02a	$45,500	$31,900	$77,400	$5,920	$83,320
	LOK021	BLM Polygon	Upland waste rock	C02a	$96,100	$67,300	$163,400	$12,500	$175,900
	LOK022	BLM Polygon	Upland waste rock	C02a	$124,000	$86,700	$210,700	$16,100	$226,800
	LOK024	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$111,000	$77,900	$188,900	$14,500	$203,400
	LOK025	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560
	LOK026	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	LOK027	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	LOK028	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02a	$38,800	$27,100	$65,900	$5,040	$70,940
	LOK041	BLM Polygon	Upland waste rock	C02a	$79,200	$55,500	$134,700	$10,300	$145,000
	LOK044	BLM Polygon	Upland waste rock	C02b	$127,000	$88,800	$215,800	$16,500	$232,300
	LOK045	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	LOK047	BLM Polygon	Upland waste rock	C02a	$191,000	$133,000	$324,000	$24,800	$348,800
	LOK048	BLM Polygon	Floodplain waste rock	C01	$27,200	$19,100	$46,300	$0	$46,300
				C07	$95,300	$66,700	$162,000	$21,000	$183,000
	LOK050	BLM Polygon	Upland tailings - inactive facilities	C01	$54,600	$38,200	$92,800	$0	$92,800
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
	LOK051	BLM Polygon	Floodplain artificial fill	C01	$193,000	$135,000	$328,000	$0	$328,000
				C08a	$811,000	$568,000	$1,379,000	$114,000	$1,493,000
				HAUL-2	$252,000	$176,000	$428,000	$0	$428,000
	LOK052	BLM Polygon	Upland waste rock	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	LOK053	BLM Polygon	Upland waste rock (erosion potential)	C02a	$26,100	$18,300	$44,400	$3,400	$47,800
	LOK054	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	MUL001	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$18,300	$19,600	$37,900	$1,090	$38,990
			Floodplain waste rock	C01	$317,000	$222,000	$539,000	$0	$539,000
				C08a	$1,330,000	$934,000	$2,264,000	$187,000	$2,451,000
				HAUL-2	$414,000	$290,000	$704,000	$0	$704,000
	MUL002	BLM Polygon	Upland tailings	C01	$96,600	$67,600	$164,200	$0	$164,200
				C08a	$407,000	$285,000	$692,000	$57,000	$749,000
				HAUL-2	$126,000	$88,400	$214,400	$0	$214,400
	MUL003	BLM Polygon	Upland waste rock	C02a	$231,000	$162,000	$393,000	$30,000	$423,000
	MUL004	BLM Polygon	Floodplain waste rock	C01	$82,700	$57,900	$140,600	$0	$140,600
				C08a	$348,000	$244,000	$592,000	$48,800	$640,800
				HAUL-2	$108,000	$75,600	$183,600	$0	$183,600
	MUL005	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL006	BLM Polygon	Floodplain waste rock	C01	$73,600	$51,500	$125,100	$0	$125,100
				C08a	$310,000	$217,000	$527,000	$43,400	$570,400
				HAUL-2	$96,200	$67,300	$163,500	$0	$163,500
	MUL007	BLM Polygon	Upland waste rock (erosion potential)	C02a	$80,100	$56,100	$136,200	$10,400	$146,600
	MUL008	BLM Polygon	Floodplain waste rock	C01	$139,000	$97,000	$236,000	$0	$236,000
				C08a	$584,000	$409,000	$993,000	$81,800	$1,074,800
				HAUL-2	$181,000	$127,000	$308,000	$0	$308,000
	MUL009	BLM Polygon	Upland waste rock (erosion potential)	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL010	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	MUL011	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MUL012	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				WT01	$210,000	$224,000	$434,000	$15,500	$449,500
			Floodplain waste rock	C01	$907,000	$635,000	$1,542,000	$0	$1,542,000
				C07	$3,180,000	$2,220,000	$5,400,000	$699,000	$6,099,000
	MUL013	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$60,300	$64,500	$124,800	$3,590	$128,390
			Upland waste rock (erosion potential)	C02a	$44,700	$31,300	$76,000	$5,810	$81,810
	MUL014	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$1,100,000	$1,170,000	$2,270,000	$65,300	$2,335,300
			Upland waste rock (erosion potential)	C01	$33,300	$23,300	$56,600	$0	$56,600
				C07	$116,000	$81,500	$197,500	$25,600	$223,100
	MUL015	BLM Polygon	Upland waste rock (erosion potential)	C01	$96,600	$67,600	$164,200	$0	$164,200
				C07	$338,000	$237,000	$575,000	$74,400	$649,400
	MUL016	BLM Polygon	Upland waste rock	C02a	$46,400	$32,500	$78,900	$6,030	$84,930
	MUL017	BLM Polygon	Upland waste rock	C02a	$45,500	$31,900	$77,400	$5,920	$83,320
	MUL018	BLM Polygon	Floodplain waste rock	C01	$60,500	$42,300	$102,800	$0	$102,800
				C08a	$255,000	$178,000	$433,000	$35,700	$468,700
				HAUL-2	$79,100	$55,300	$134,400	$0	$134,400
	MUL019	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT01	$558,000	$597,000	$1,155,000	$42,400	$1,197,400
			Buildings & structures	HH-4	$1,690,000	$1,180,000	$2,870,000	$219,000	$3,089,000
			Floodplain tailings	C01	$357,000	$250,000	$607,000	$0	$607,000
				C08a	$1,500,000	$1,050,000	$2,550,000	$211,000	$2,761,000
				HAUL-2	$467,000	$327,000	$794,000	$0	$794,000
			Floodplain waste rock	C01	$1,410,000	$989,000	$2,399,000	$0	$2,399,000
				C08a	$5,950,000	$4,170,000	$10,120,000	$833,000	$10,953,000
				HAUL-2	$1,850,000	$1,290,000	$3,140,000	$0	$3,140,000
	MUL020	BLM Polygon	Floodplain sediments (underlying tailings pond)	C11j	$5,090,000	$3,560,000	$8,650,000	$102,000	$8,752,000
			Floodplain tailings - active facilities	C09	$2,710,000	$1,900,000	$4,610,000	$543,000	$5,153,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$718	$63,218
	MUL021	BLM Polygon	Floodplain waste rock	C01	$122,000	$85,400	$207,400	$0	$207,400
				C08a	$514,000	$360,000	$874,000	$72,000	$946,000
				HAUL-2	$159,000	$112,000	$271,000	$0	$271,000
	MUL022	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL023	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Floodplain waste rock	C01	$131,000	$91,700	$222,700	$0	$222,700
				C08a	$552,000	$387,000	$939,000	$77,300	$1,016,300
				HAUL-2	$171,000	$120,000	$291,000	$0	$291,000
	MUL024	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Upland waste rock	C02b	$187,000	$131,000	$318,000	$24,300	$342,300
	MUL025	BLM Polygon	Upland waste rock	C02a	$85,100	$59,600	$144,700	$11,100	$155,800

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL026	BLM Polygon	Upland waste rock	C02b	$170,000	$119,000	$289,000	$22,100	$311,100
	MUL027	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$221,000	$155,000	$376,000	$547,000	$923,000
			Upland waste rock	C01	$99,800	$69,900	$169,700	$0	$169,700
				C07	$349,000	$244,000	$593,000	$76,800	$669,800
	MUL028	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$362,000	$253,000	$615,000	$1,100,000	$1,715,000
			Floodplain waste rock	C01	$428,000	$300,000	$728,000	$0	$728,000
				C07	$1,500,000	$1,050,000	$2,550,000	$330,000	$2,880,000
	MUL029	BLM Polygon	Floodplain waste rock	C01	$85,700	$60,000	$145,700	$0	$145,700
				C07	$300,000	$210,000	$510,000	$66,000	$576,000
	MUL030	BLM Polygon	Floodplain waste rock	C01	$36,300	$25,400	$61,700	$0	$61,700
				C07	$127,000	$88,900	$215,900	$27,900	$243,800
	MUL031	BLM Polygon	Upland waste rock (erosion potential)	C01	$34,300	$24,000	$58,300	$0	$58,300
				C07	$120,000	$84,000	$204,000	$26,400	$230,400
	MUL032	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL033	BLM Polygon	Floodplain waste rock	C01	$66,500	$46,600	$113,100	$0	$113,100
				C07	$233,000	$163,000	$396,000	$51,200	$447,200
	MUL034	BLM Polygon	Upland waste rock	C02b	$73,500	$51,400	$124,900	$9,550	$134,450
	MUL035	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL036	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL037	BLM Polygon	Floodplain sediments	C01b	$582,000	$407,000	$989,000	$0	$989,000
				C08a	$781,000	$546,000	$1,327,000	$109,000	$1,436,000
				HAUL-2	$242,000	$169,000	$411,000	$0	$411,000
			Floodplain sediments (underlying tailings pond)	C11j	$5,410,000	$3,780,000	$9,190,000	$108,000	$9,298,000
			Floodplain tailings - active facilities	C09	$2,470,000	$1,730,000	$4,200,000	$494,000	$4,694,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$718	$63,218
	MUL038	BLM Polygon	Floodplain tailings	C01	$54,600	$38,200	$92,800	$0	$92,800
				C08a	$230,000	$161,000	$391,000	$32,200	$423,200
				HAUL-2	$71,400	$50,000	$121,400	$0	$121,400
			Floodplain waste rock	C01	$279,000	$195,000	$474,000	$0	$474,000
				C08a	$1,180,000	$824,000	$2,004,000	$165,000	$2,169,000
				HAUL-2	$365,000	$255,000	$620,000	$0	$620,000
	MUL040	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MUL041	BLM Polygon	Upland waste rock	C02a	$314,000	$220,000	$534,000	$40,800	$574,800
	MUL042	BLM Polygon	Floodplain waste rock	C01	$58,500	$40,900	$99,400	$0	$99,400
				C07	$205,000	$143,000	$348,000	$45,000	$393,000
	MUL043	BLM Polygon	Floodplain waste rock	C01	$73,600	$51,500	$125,100	$0	$125,100
				C07	$258,000	$180,000	$438,000	$56,700	$494,700
	MUL045	BLM Polygon	Floodplain waste rock	C01	$116,000	$81,100	$197,100	$0	$197,100
				C07	$406,000	$284,000	$690,000	$89,300	$779,300
	MUL046	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL047	BLM Polygon	Floodplain waste rock	C01	$23,200	$16,200	$39,400	$0	$39,400
				C07	$81,100	$56,800	$137,900	$17,900	$155,800
	MUL048	BLM Polygon	Floodplain waste rock	C01	$89,700	$62,800	$152,500	$0	$152,500
				C08a	$378,000	$265,000	$643,000	$52,900	$695,900
				HAUL-2	$117,000	$82,100	$199,100	$0	$199,100
	MUL049	BLM Polygon	Upland waste rock (erosion potential)	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL050	BLM Polygon	Upland waste rock	C02a	$31,200	$21,800	$53,000	$4,050	$57,050
	MUL051	BLM Polygon	Floodplain waste rock	C01	$121,000	$84,700	$205,700	$0	$205,700
				C07	$423,000	$296,000	$719,000	$93,100	$812,100
	MUL052	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$390,000	$273,000	$663,000	$1,160,000	$1,823,000
			Floodplain waste rock	C01	$63,000	$44,100	$107,100	$0	$107,100
				C07	$221,000	$154,000	$375,000	$48,500	$423,500
	MUL053	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$667,000	$467,000	$1,134,000	$1,330,000	$2,464,000
			Upland waste rock (erosion potential)	C01	$307,000	$215,000	$522,000	$0	$522,000
				C07	$1,070,000	$751,000	$1,821,000	$236,000	$2,057,000
	MUL054	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$173,000	$121,000	$294,000	$536,000	$830,000
			Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL055	BLM Polygon	Upland waste rock	C02a	$220,000	$154,000	$374,000	$28,600	$402,600
	MUL056	BLM Polygon	Upland waste rock (erosion potential)	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL057	BLM Polygon	Upland waste rock (erosion potential)	C02a	$66,600	$46,600	$113,200	$8,660	$121,860
	MUL058	BLM Polygon	Floodplain sediments	C01b	$1,850,000	$1,290,000	$3,140,000	$0	$3,140,000
				C08a	$2,480,000	$1,730,000	$4,210,000	$347,000	$4,557,000
				HAUL-2	$769,000	$538,000	$1,307,000	$0	$1,307,000
			Floodplain sediments (underlying tailings pond)	C11j	$9,700,000	$6,790,000	$16,490,000	$194,000	$16,684,000
			Floodplain tailings - active facilities	C09	$8,540,000	$5,980,000	$14,520,000	$1,710,000	$16,230,000
			Groundwater	WT01	$30,200	$32,300	$62,500	$718	$63,218
	MUL059	BLM Polygon	Floodplain waste rock	C01	$94,800	$66,300	$161,100	$0	$161,100
				C08a	$399,000	$280,000	$679,000	$55,900	$734,900
				HAUL-2	$124,000	$86,700	$210,700	$0	$210,700
	MUL060	BLM Polygon	Floodplain waste rock	C01	$21,200	$14,800	$36,000	$0	$36,000
				C08a	$89,200	$62,400	$151,600	$12,500	$164,100
				HAUL-2	$27,700	$19,400	$47,100	$0	$47,100
	MUL061	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL062	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL063	BLM Polygon	Floodplain waste rock	C01	$21,200	$14,800	$36,000	$0	$36,000
				C08a	$89,200	$62,400	$151,600	$12,500	$164,100
				HAUL-2	$27,700	$19,400	$47,100	$0	$47,100
	MUL064	BLM Polygon	Upland waste rock	C02a	$47,200	$33,000	$80,200	$6,140	$86,340

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Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL065	BLM Polygon	Floodplain waste rock	C01	$31,200	$21,900	$53,100	$0	$53,100
				C08a	$132,000	$92,200	$224,200	$18,400	$242,600
				HAUL-2	$40,800	$28,600	$69,400	$0	$69,400
	MUL066	BLM Polygon	Upland waste rock	C02a	$79,200	$55,500	$134,700	$10,300	$145,000
	MUL067	BLM Polygon	Upland waste rock	C02a	$113,000	$79,100	$192,100	$14,700	$206,800
	MUL068	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MUL069	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	MUL071	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
			Floodplain waste rock	C01	$10,500	$7,350	$17,850	$0	$17,850
				C08a	$44,300	$31,000	$75,300	$6,200	$81,500
				HAUL-2	$13,700	$9,610	$23,310	$0	$23,310
	MUL072	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$311,000	$218,000	$529,000	$1,040,000	$1,569,000
			Upland waste rock	C02a	$64,900	$45,400	$110,300	$8,440	$118,740
	MUL073	BLM Polygon	Upland waste rock	C02a	$174,000	$122,000	$296,000	$22,600	$318,600
	MUL074	BLM Polygon	Upland waste rock	C02a	$38,800	$27,100	$65,900	$5,040	$70,940
	MUL075	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	MUL076	BLM Polygon	Upland waste rock	C02a	$29,500	$20,700	$50,200	$3,840	$54,040
	MUL077	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	MUL078	BLM Polygon	Upland waste rock	C02a	$96,100	$67,300	$163,400	$12,500	$175,900
	MUL079	BLM Polygon	Upland waste rock	C02a	$75,000	$52,500	$127,500	$9,750	$137,250
	MUL080	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	MUL081	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT03	$164,000	$115,000	$279,000	$536,000	$815,000
			Floodplain waste rock	C01	$33,600	$23,500	$57,100	$0	$57,100
				C08a	$142,000	$99,100	$241,100	$19,800	$260,900
				HAUL-2	$43,900	$30,700	$74,600	$0	$74,600
	MUL082	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL083	BLM Polygon	Floodplain waste rock	C01	$64,500	$45,200	$109,700	$0	$109,700
				C08a	$272,000	$190,000	$462,000	$38,100	$500,100
				HAUL-2	$84,300	$59,000	$143,300	$0	$143,300
	MUL084	BLM Polygon	Upland waste rock	C02a	$95,300	$66,700	$162,000	$12,400	$174,400
	MUL103	BLM Polygon	Adit drainage	C10	$9,680	$6,780	$16,460	$1,740	$18,200
				WT02	$493,000	$345,000	$838,000	$1,190,000	$2,028,000
			Floodplain waste rock	C01	$26,500	$18,500	$45,000	$0	$45,000
				C08a	$112,000	$78,100	$190,100	$15,600	$205,700
				HAUL-2	$34,600	$24,200	$58,800	$0	$58,800
	MUL107	BLM Polygon	Upland waste rock	C02a	$11,000	$7,670	$18,670	$1,420	$20,090
	MUL108	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	MUL109	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	MUL110	BLM Polygon	Upland waste rock	C02a	$11,800	$8,260	$20,060	$1,530	$21,590
	MUL111	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL112	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL113	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	MUL114	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	MUL115	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	MUL116	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL117	BLM Polygon	Upland waste rock	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL118	BLM Polygon	Upland waste rock	C02a	$27,000	$18,900	$45,900	$3,510	$49,410
	MUL119	BLM Polygon	Upland waste rock (erosion potential)	C02a	$23,600	$16,500	$40,100	$3,070	$43,170
	MUL120	BLM Polygon	Floodplain waste rock	C01	$2,350	$1,650	$4,000	$0	$4,000
				C08a	$9,910	$6,940	$16,850	$1,390	$18,240
				HAUL-2	$3,070	$2,150	$5,220	$0	$5,220
	MUL121	BLM Polygon	Upland waste rock	C02a	$13,500	$9,440	$22,940	$1,750	$24,690
	MUL122	BLM Polygon	Upland waste rock	C02a	$17,700	$12,400	$30,100	$2,300	$32,400
	MUL123	BLM Polygon	Upland waste rock	C02a	$12,600	$8,850	$21,450	$1,640	$23,090
	MUL124	BLM Polygon	Upland waste rock	C02a	$15,200	$10,600	$25,800	$1,970	$27,770
	MUL125	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL126	BLM Polygon	Upland waste rock	C02a	$18,500	$13,000	$31,500	$2,410	$33,910
	MUL127	BLM Polygon	Upland waste rock	C02a	$19,400	$13,600	$33,000	$2,520	$35,520
	MUL128	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MUL129	BLM Polygon	Floodplain waste rock	C01	$112,000	$78,300	$190,300	$0	$190,300
				C08a	$472,000	$330,000	$802,000	$66,000	$868,000
				HAUL-2	$146,000	$102,000	$248,000	$0	$248,000
	MUL130	BLM Polygon	Upland waste rock	C02a	$149,000	$104,000	$253,000	$19,400	$272,400
	MUL131	BLM Polygon	Upland tailings	C01	$27,700	$19,400	$47,100	$0	$47,100
				C08a	$117,000	$81,800	$198,800	$16,400	$215,200
				HAUL-2	$36,200	$25,400	$61,600	$0	$61,600
	MUL132	BLM Polygon	Upland tailings	C01	$7,560	$5,290	$12,850	$0	$12,850
				C08a	$31,900	$22,300	$54,200	$4,460	$58,660
				HAUL-2	$9,880	$6,920	$16,800	$0	$16,800
	MUL133	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL134	BLM Polygon	Upland waste rock	C02a	$48,900	$34,200	$83,100	$6,360	$89,460
	MUL135	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL136	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL137	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MUL138	BLM Polygon	Upland waste rock	C02a	$68,300	$47,800	$116,100	$8,880	$124,980
	MUL139	BLM Polygon	Upland waste rock (erosion potential)	C01	$840	$588	$1,428	$0	$1,428
				C07	$2,940	$2,060	$5,000	$647	$5,647
	MUL140	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	MUL141	BLM Polygon	Floodplain sediments	C01b	$127,000	$89,200	$216,200	$0	$216,200
				C08a	$171,000	$120,000	$291,000	$23,900	$314,900

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
				HAUL-2	$53,000	$37,100	$90,100	$0	$90,100
	MUL142	BLM Polygon	Floodplain sediments	C01b	$453,000	$317,000	$770,000	$0	$770,000
				C08a	$607,000	$425,000	$1,032,000	$85,000	$1,117,000
				HAUL-2	$188,000	$132,000	$320,000	$0	$320,000
	MUL143	BLM Polygon	Upland waste rock	C02a	$30,300	$21,200	$51,500	$3,950	$55,450
	MUL144	BLM Polygon	Upland waste rock	C02a	$20,200	$14,200	$34,400	$2,630	$37,030
	MUL145	BLM Polygon	Floodplain sediments	C01b	$55,400	$38,800	$94,200	$0	$94,200
				C08a	$74,300	$52,000	$126,300	$10,400	$136,700
				HAUL-2	$23,100	$16,100	$39,200	$0	$39,200
	MUL146	BLM Polygon	Upland waste rock (erosion potential)	C01	$132,000	$92,400	$224,400	$0	$224,400
				C07	$462,000	$324,000	$786,000	$102,000	$888,000
	MUL147	BLM Polygon	Upland waste rock	C02a	$16,000	$11,200	$27,200	$2,080	$29,280
	MUL148	BLM Polygon	Upland waste rock	C02b	$112,000	$78,300	$190,300	$14,500	$204,800
	MUL149	BLM Polygon	Floodplain sediments	C01b	$74,600	$52,200	$126,800	$0	$126,800
				C08a	$100,000	$70,000	$170,000	$14,000	$184,000
				HAUL-2	$31,000	$21,700	$52,700	$0	$52,700
	MUL150	BLM Polygon	Floodplain sediments	C01b	$199,000	$140,000	$339,000	$0	$339,000
				C08a	$267,000	$187,000	$454,000	$37,400	$491,400
				HAUL-2	$82,900	$58,000	$140,900	$0	$140,900
	MUL151	BLM Polygon	Upland waste rock	C02a	$21,100	$14,800	$35,900	$2,740	$38,640
	MUL152	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	MUL153	BLM Polygon	Floodplain sediments	C01b	$100,000	$70,200	$170,200	$0	$170,200
				C08a	$135,000	$94,200	$229,200	$18,800	$248,000
				HAUL-2	$41,700	$29,200	$70,900	$0	$70,900
	MUL154	BLM Polygon	Upland waste rock	C02a	$147,000	$103,000	$250,000	$19,100	$269,100
	MUL155	BLM Polygon	Upland waste rock	C02a	$32,000	$22,400	$54,400	$4,160	$58,560
	MUL156	BLM Polygon	Upland waste rock	C02a	$14,300	$10,000	$24,300	$1,860	$26,160
	MUL157	BLM Polygon	Upland waste rock	C02a	$9,270	$6,490	$15,760	$1,210	$16,970
	THO019	BLM Polygon	Upland waste rock	C02a	$28,700	$20,100	$48,800	$3,730	$52,530
	THO020	BLM Polygon	Floodplain waste rock	C01	$29,200	$20,500	$49,700	$0	$49,700
				C08a	$123,000	$86,200	$209,200	$17,200	$226,400
				HAUL-2	$38,200	$26,700	$64,900	$0	$64,900
	THO021	BLM Polygon	Upland waste rock	C02a	$25,300	$17,700	$43,000	$3,290	$46,290
	UG01-1	Bioengineering Reach	BioReach General Characteristics	FP/RP-AVG	$14,200	$9,930	$24,130	$2,550	$26,680
	UG01-10	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
				CD-AVG	$63,900	$44,700	$108,600	$19,200	$127,800
				FP/RP-AVG	$156,000	$109,000	$265,000	$28,100	$293,100
				VBS-AVG	$56,000	$39,200	$95,200	$16,800	$112,000
	UG01-11	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$42,700	$29,900	$72,600	$12,800	$85,400
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				FP/RP-AVG	$143,000	$100,000	$243,000	$25,800	$268,800
				VBS-AVG	$33,800	$23,700	$57,500	$10,100	$67,600

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	UG01-12	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$541,000	$379,000	$920,000	$162,000	$1,082,000
				CD-AVG	$183,000	$128,000	$311,000	$55,000	$366,000
				FP/RP-AVG	$1,160,000	$814,000	$1,974,000	$209,000	$2,183,000
				OFFCH-AVG	$623,000	$436,000	$1,059,000	$112,000	$1,171,000
				VBS-AVG	$231,000	$161,000	$392,000	$69,200	$461,200
	UG01-13	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$297,000	$208,000	$505,000	$89,100	$594,100
				CD-AVG	$101,000	$70,700	$171,700	$30,300	$202,000
				FP/RP-AVG	$65,200	$45,600	$110,800	$11,700	$122,500
				OFFCH-AVG	$503,000	$352,000	$855,000	$90,500	$945,500
				VBS-AVG	$127,000	$88,600	$215,600	$38,000	$253,600
	UG01-14	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$57,600	$40,300	$97,900	$17,300	$115,200
				CD-AVG	$18,500	$13,000	$31,500	$5,560	$37,060
				FP/RP-AVG	$19,000	$13,300	$32,300	$3,410	$35,710
				VBS-AVG	$24,500	$17,200	$41,700	$7,360	$49,060
	UG01-15	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$207,000	$145,000	$352,000	$62,000	$414,000
				CD-AVG	$70,000	$49,000	$119,000	$21,000	$140,000
				FP/RP-AVG	$5,400	$3,780	$9,180	$973	$10,153
				VBS-AVG	$88,100	$61,700	$149,800	$26,400	$176,200
	UG01-16	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$190,000	$133,000	$323,000	$57,000	$380,000
				CD-AVG	$61,800	$43,300	$105,100	$18,500	$123,600
				FP/RP-AVG	$381,000	$267,000	$648,000	$68,700	$716,700
				VBS-AVG	$150,000	$105,000	$255,000	$45,100	$300,100
	UG01-17	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$386,000	$271,000	$657,000	$116,000	$773,000
				CD-AVG	$152,000	$107,000	$259,000	$45,700	$304,700
				FP/RP-AVG	$1,000,000	$703,000	$1,703,000	$181,000	$1,884,000
				OFFCH-AVG	$831,000	$582,000	$1,413,000	$150,000	$1,563,000
				VBS-AVG	$306,000	$214,000	$520,000	$91,800	$611,800
	UG01-18	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$364,000	$255,000	$619,000	$109,000	$728,000
				CD-AVG	$124,000	$86,500	$210,500	$37,100	$247,600
				FP/RP-AVG	$20,000	$14,000	$34,000	$3,610	$37,610
				VBS-AVG	$155,000	$109,000	$264,000	$46,500	$310,500
	UG01-19	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$59,800	$41,800	$101,600	$17,900	$119,500
				CD-AVG	$14,400	$10,100	$24,500	$4,330	$28,830
				FP/RP-AVG	$37,600	$26,300	$63,900	$6,770	$70,670
				OFFCH-AVG	$46,300	$32,400	$78,700	$8,340	$87,040
				VBS-AVG	$47,300	$33,100	$80,400	$14,200	$94,600
	UG01-4	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$6,220	$4,360	$10,580	$1,870	$12,450
				VBS-AVG	$5,360	$3,750	$9,110	$1,610	$10,720
	UG01-5	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$190,000	$133,000	$323,000	$57,000	$380,000
				CD-AVG	$63,900	$44,700	$108,600	$19,200	$127,800
				FP/RP-AVG	$124,000	$87,100	$211,100	$22,400	$233,500
				VBS-AVG	$81,000	$56,700	$137,700	$24,300	$162,000

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	UG01-6	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$171,000	$120,000	$291,000	$51,200	$342,200
				CD-AVG	$61,800	$43,300	$105,100	$18,500	$123,600
				FP/RP-AVG	$485,000	$340,000	$825,000	$87,400	$912,400
				OFFCH-AVG	$1,580,000	$1,110,000	$2,690,000	$285,000	$2,975,000
				VBS-AVG	$135,000	$94,600	$229,600	$40,600	$270,200
	UG01-7	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$98,200	$68,700	$166,900	$29,500	$196,400
				CD-AVG	$53,600	$37,500	$91,100	$16,100	$107,200
				FP/RP-AVG	$281,000	$197,000	$478,000	$50,600	$528,600
				VBS-AVG	$77,700	$54,400	$132,100	$23,300	$155,400
	UG01-8	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$39,800	$27,800	$67,600	$11,900	$79,500
				CD-AVG	$16,500	$11,500	$28,000	$4,940	$32,940
				FP/RP-AVG	$206,000	$144,000	$350,000	$37,000	$387,000
				VBS-AVG	$14,800	$10,400	$25,200	$4,450	$29,650
	UG01-9	Bioengineering Reach	BioReach General Characteristics	BSBR-AVG	$175,000	$123,000	$298,000	$52,500	$350,500
				CD-AVG	$82,400	$57,700	$140,100	$24,700	$164,800
				FP/RP-AVG	$133,000	$92,900	$225,900	$23,900	$249,800
				VBS-AVG	$139,000	$97,000	$236,000	$41,600	$277,600
	WAL013	BLM Polygon	Floodplain waste rock	C01	$34,300	$24,000	$58,300	$0	$58,300
				C08a	$144,000	$101,000	$245,000	$20,200	$265,200
				HAUL-2	$44,800	$31,400	$76,200	$0	$76,200
	WAL038	BLM Polygon	Floodplain sediments	C01b	$4,370,000	$3,060,000	$7,430,000	$0	$7,430,000
				C08a	$5,860,000	$4,100,000	$9,960,000	$821,000	$10,781,000
				C11j	$41,300,000	$28,900,000	$70,200,000	$827,000	$71,027,000
				HAUL-2	$1,820,000	$1,270,000	$3,090,000	$0	$3,090,000
	WAL038	BLM Polygon	Groundwater	WT01	$1,820,000	$1,940,000	$3,760,000	$216,000	$3,976,000
	WAL068	BLM Polygon	Upland waste rock	C02a	$24,400	$17,100	$41,500	$3,180	$44,680
	WAL076	BLM Polygon	Floodplain waste rock	C01	$171,000	$120,000	$291,000	$0	$291,000
				C08a	$722,000	$506,000	$1,228,000	$101,000	$1,329,000
				HAUL-2	$224,000	$157,000	$381,000	$0	$381,000
	WAL077	BLM Polygon	Floodplain sediments	C01b	$554,000	$388,000	$942,000	$0	$942,000
				C08a	$743,000	$520,000	$1,263,000	$104,000	$1,367,000
				HAUL-2	$231,000	$161,000	$392,000	$0	$392,000

Notes:

This Table does not include CTP Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

Typical Conceptual Design (TCD) Codes

TABLE D-38
Summary of Estimated Costs for Sites by Trait and TCD, Alternative 4+
Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	Source Type Description	Trait Description (Waste Types)	TCD	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)

BSBR-AVG = Bank Stabilization via Revetments - Average Cost
C01 = Excavation (dry)
C01b = Excavation (60% dry/40% wet)
C02a = Regrade/Consolidate/Vegetative Cover: Lower Part of Pile in 100-Year Floodplain
C02b = Regrade/Consolidate/Vegetative Cover: Waste Rock Pile in Stream Valley
C06 = Waste Consolidation Area with Erosion Protection
C07 = Waste Consolidation Area Above Flood Level
C08a = Regional Repository, 1 million cy
C09 = Impoundment Closure
C10 = Adit Drainage Collection
C11j = Hydraulic Isolation Using Slurry Wall (with drain, 30 ft deep)
C14c = Stream Lining (100 feet wide)
C15b = French Drain (15 feet bgs)
CD-AVG = Current Deflector Average Cost
CD-SED = Current Deflector Sediment Traps
CH REAL-1 = Channel Realignment
FP/RP-AVG = Floodplain and Riparian Replanting - Average Cost
HAUL-2 = Haul to Regional Repository
HH-4 = Millsite Demolition/Disposal
OFFCH-AVG = Off-Channel Hydrologic Feature Average Cost
PIPE-1 = Conveyance Pipeline (6-inch)
PIPE-2 = Conveyance Pipeline (12-inch)
PIPE-3 = Conveyance Pipeline (24-inch)
VBS-AVG = Vegetative Bank Stabilization - Average Cost
WT01 = Centralized High-Density Sludge (HDS) Treatment at Central Treatment Plant (CTP)
WT02 = Onsite Semi-Passive Water Treatment Using Lime Addition and Settling Pond(s)
WT03 = Onsite Semi-Passive Water Treatment Using Sulfate-Reducing Bioreactor (SRB) System

NOTE: The above costs are presented rounded to three significant figures
NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
BigCrkSeg01	POL044	$4,470	$3,100	$7,600	$1,030	$8,630
	POL052	$86,900	$61,000	$148,000	$14,900	$163,000
BigCrkSeg03	POL001	$5,070	$3,600	$8,620	$1,170	$9,790
	POL002	$32,100	$23,000	$54,600	$5,500	$60,100
	POL067	$531,000	$370,000	$902,000	$1,210,000	$2,110,000
	POL068	$16,900	$12,000	$28,700	$2,190	$30,900
BigCrkSeg04	BIG04-2	$238,000	$170,000	$405,000	$92,700	$498,000
	BIG04-3	$2,350,000	$1,600,000	$4,000,000	$704,000	$4,710,000
	KLE025	$5,930,000	$4,200,000	$10,100,000	$1,190,000	$11,300,000
	KLE026	$182,000	$130,000	$309,000	$41,800	$351,000
	KLE027	$1,760,000	$1,200,000	$2,990,000	$301,000	$3,290,000
	KLE047	$121,000	$85,000	$206,000	$8,230	$214,000
	KLE053	$3,720,000	$2,600,000	$6,310,000	$636,000	$6,950,000
	KLE054	$3,520,000	$2,500,000	$6,000,000	$1,710,000	$7,710,000
	KLE071	$1,430,000	$1,000,000	$2,430,000	$97,100	$2,520,000
	KLE073	$3,640,000	$2,500,000	$6,190,000	$248,000	$6,440,000
	POL008	$154,000	$110,000	$262,000	$26,400	$289,000
	POL010	$86,200	$60,000	$147,000	$14,700	$161,000
	POL011	$59,000	$41,000	$100,000	$10,100	$110,000
	POL022	$12,700	$8,900	$21,600	$2,910	$24,500
	POL066	$3,780	$2,600	$6,430	$647	$7,080
CCSeg	PIPECC	$6,810,000	$4,800,000	$11,600,000	$546,000	$12,100,000
CCSeg01	BUR105	$88,100	$62,000	$150,000	$7,290	$157,000
	BUR109	$280,000	$200,000	$476,000	$30,800	$507,000
	BUR185	$70,000	$49,000	$119,000	$8,370	$127,000
	BUR187	$56,500	$40,000	$96,000	$6,750	$103,000
	THO023	$43,000	$30,000	$73,000	$5,130	$78,100
CCSeg02	BUR107	$781,000	$570,000	$1,350,000	$142,000	$1,490,000
	BUR130	$539,000	$380,000	$915,000	$64,300	$980,000
	BUR132	$453,000	$320,000	$770,000	$45,100	$816,000
	BUR133	$100,000	$70,000	$170,000	$17,100	$187,000
	BUR134	$273,000	$190,000	$463,000	$46,600	$509,000
	BUR135	$131,000	$92,000	$223,000	$15,700	$238,000
	BUR145	$1,060,000	$740,000	$1,800,000	$181,000	$1,980,000
	BUR150	$333,000	$230,000	$567,000	$36,700	$603,000
	BUR153	$637,000	$450,000	$1,080,000	$43,400	$1,130,000
	CC02-1	$1,440,000	$1,000,000	$2,450,000	$396,000	$2,840,000
CCSeg03	BUR087	$926,000	$650,000	$1,570,000	$105,000	$1,680,000
	BUR088	$70,000	$71,000	$141,000	$5,330	$147,000
	BUR089	$45,200	$32,000	$76,800	$5,400	$82,200
	BUR090	$2,970,000	$2,100,000	$5,050,000	$380,000	$5,430,000
	BUR099	$70,000	$71,000	$141,000	$5,330	$147,000
	BUR146	$928,000	$650,000	$1,580,000	$63,200	$1,640,000
	BUR149	$124,000	$86,000	$210,000	$13,800	$224,000
	BUR166	$74,500	$52,000	$127,000	$8,910	$135,000
	BUR180	$56,400	$39,000	$95,900	$6,210	$102,000
CCSeg04	BUR066	$73,400	$51,000	$125,000	$8,100	$133,000
	BUR067	$5,380,000	$4,100,000	$9,500,000	$761,000	$10,300,000
	BUR068	$226,000	$160,000	$385,000	$38,800	$424,000
	BUR072	$392,000	$270,000	$666,000	$47,000	$713,000
	BUR073	$1,300,000	$900,000	$2,200,000	$142,000	$2,340,000
	BUR075	$66,200	$46,000	$113,000	$11,300	$124,000
	BUR094	$118,000	$83,000	$201,000	$15,300	$216,000
	BUR096	$135,000	$96,000	$230,000	$17,600	$248,000
	BUR097	$952,000	$990,000	$1,940,000	$63,000	$2,000,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	BUR098	$1,950,000	$1,700,000	$3,660,000	$250,000	$3,910,000
	BUR112	$70,000	$71,000	$141,000	$5,330	$147,000
	BUR117	$284,000	$200,000	$483,000	$35,800	$519,000
	BUR118	$624,000	$440,000	$1,060,000	$107,000	$1,170,000
	BUR119	$175,000	$120,000	$298,000	$22,800	$321,000
	BUR120	$78,400	$55,000	$133,000	$10,200	$144,000
	BUR121	$1,230,000	$1,100,000	$2,340,000	$96,600	$2,440,000
	BUR122	$275,000	$190,000	$467,000	$30,200	$497,000
	BUR124	$84,300	$59,000	$143,000	$11,000	$154,000
	BUR125	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR128	$1,160,000	$890,000	$2,050,000	$160,000	$2,210,000
	BUR129	$169,000	$140,000	$310,000	$22,300	$332,000
	BUR141	$800,000	$560,000	$1,360,000	$54,500	$1,420,000
	BUR142	$726,000	$510,000	$1,230,000	$89,400	$1,320,000
	BUR143	$1,160,000	$820,000	$1,980,000	$79,300	$2,060,000
	BUR144	$605,000	$420,000	$1,030,000	$68,600	$1,100,000
	BUR176	$126,000	$88,000	$214,000	$15,100	$230,000
	BUR177	$153,000	$110,000	$260,000	$18,400	$279,000
	BUR178	$113,000	$79,000	$192,000	$12,400	$205,000
	BUR189	$45,200	$32,000	$76,800	$5,400	$82,200
	BUR190	$312,000	$330,000	$641,000	$14,600	$656,000
	BUR191	$131,000	$92,000	$223,000	$17,000	$240,000
	BUR192	$333,000	$230,000	$566,000	$40,200	$606,000
	BUR204	$43,000	$30,000	$73,000	$5,130	$78,100
	CC04-1	$2,170,000	$1,500,000	$3,690,000	$803,000	$4,490,000
	HHWPCC04-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPCC04-2	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPCC04-3	$58,400	$41,000	$99,300	$7,600	$107,000
CCSeg05	CC05-1	$1,080,000	$750,000	$1,830,000	$224,000	$2,060,000
	CC05-2	$6,560,000	$4,600,000	$11,200,000	$1,340,000	$12,500,000
	OSB047	$127,000	$89,000	$216,000	$8,640	$224,000
	WAL010	$37,200	$26,000	$63,100	$2,530	$65,700
	WAL011	$80,000	$56,000	$136,000	$5,450	$142,000
	WAL039	$342,000	$240,000	$582,000	$31,000	$613,000
	WAL040	$471,000	$330,000	$802,000	$32,100	$834,000
	WAL041	$144,000	$100,000	$245,000	$9,830	$255,000
	WAL042	$579,000	$410,000	$985,000	$69,500	$1,050,000
	WAL081	$78,000	$55,000	$133,000	$7,060	$140,000
	WP-OPTIONC	$9,270,000	$6,700,000	$15,900,000	$268,000	$16,200,000
MIDGradSeg	PIPEMG	$12,600,000	$8,800,000	$21,400,000	$1,010,000	$22,400,000
MIDGradSeg01	HHWPMG01-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-2	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-3	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-4	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPMG01-5	$58,400	$41,000	$99,300	$7,600	$107,000
	KLE011	$1,940,000	$1,400,000	$3,300,000	$388,000	$3,690,000
	KLE016	$140,000	$98,000	$238,000	$16,700	$255,000
	KLE020	$363,000	$250,000	$617,000	$40,000	$657,000
	KLE021	$146,000	$100,000	$248,000	$17,600	$266,000
	KLE023	$259,000	$180,000	$440,000	$31,100	$471,000
	KLE033	$381,000	$270,000	$648,000	$43,200	$691,000
	KLE034	$534,000	$370,000	$907,000	$61,800	$969,000
	KLE035	$3,420,000	$2,400,000	$5,810,000	$370,000	$6,180,000
	KLE040	$14,000,000	$9,900,000	$23,900,000	$423,000	$24,300,000
	KLE042	$2,070,000	$1,400,000	$3,510,000	$166,000	$3,680,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	KLE048	$14,000,000	$10,000,000	$24,000,000	$506,000	$24,500,000
	KLE049	$14,800,000	$11,000,000	$25,400,000	$638,000	$26,000,000
	KLE051	$74,500	$52,000	$127,000	$8,910	$135,000
	KLE062	$946,000	$660,000	$1,610,000	$64,400	$1,670,000
	KLE066	$85,700	$60,000	$146,000	$10,300	$156,000
	KLE067	$345,000	$240,000	$586,000	$1,020,000	$1,600,000
	KLE068	$265,000	$190,000	$450,000	$45,300	$495,000
	KLE069	$97,200	$68,000	$165,000	$11,300	$177,000
	KLE070	$94,700	$66,000	$161,000	$11,300	$172,000
	KLE074	$401,000	$280,000	$681,000	$52,100	$733,000
	KLE075	$75,600	$53,000	$129,000	$12,900	$142,000
	MG01-1	$216,000	$150,000	$367,000	$91,100	$458,000
	MG01-10	$148,000	$100,000	$252,000	$46,900	$299,000
	MG01-11	$600,000	$420,000	$1,020,000	$145,000	$1,170,000
	MG01-12	$3,100,000	$2,200,000	$5,260,000	$605,000	$5,860,000
	MG01-13	$5,660,000	$4,000,000	$9,630,000	$1,090,000	$10,700,000
	MG01-14	$956,000	$670,000	$1,620,000	$196,000	$1,820,000
	MG01-15	$2,810,000	$2,000,000	$4,770,000	$538,000	$5,310,000
	MG01-16	$505,000	$350,000	$858,000	$106,000	$964,000
	MG01-17	$3,250,000	$2,300,000	$5,530,000	$666,000	$6,200,000
	MG01-18	$1,800,000	$1,300,000	$3,070,000	$370,000	$3,440,000
	MG01-2	$261,000	$180,000	$444,000	$83,900	$528,000
	MG01-3	$411,000	$290,000	$699,000	$110,000	$809,000
	MG01-4	$2,050,000	$1,400,000	$3,500,000	$462,000	$3,960,000
	MG01-5	$188,000	$130,000	$320,000	$63,000	$383,000
	MG01-6	$2,100,000	$1,500,000	$3,570,000	$495,000	$4,070,000
	MG01-7	$2,080,000	$1,500,000	$3,530,000	$462,000	$4,000,000
	MG01-8	$5,430,000	$3,800,000	$9,240,000	$1,040,000	$10,300,000
	MG01-9	$728,000	$510,000	$1,240,000	$152,000	$1,390,000
	MUL085	$94,800	$66,000	$161,000	$21,600	$183,000
	MUL086	$309,000	$220,000	$525,000	$34,000	$559,000
	OSB025	$123,000	$86,000	$209,000	$13,500	$222,000
	OSB030	$101,000	$71,000	$172,000	$12,200	$184,000
	OSB065	$101,000,000	$71,000,000	$173,000,000	$3,490,000	$176,000,000
	OSB070	$319,000	$220,000	$542,000	$35,100	$577,000
	OSB072	$52,000	$36,000	$88,300	$6,210	$94,500
	OSB073	$150,000	$100,000	$254,000	$15,700	$270,000
	OSB074	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	OSB075	$63,200	$44,000	$107,000	$7,560	$115,000
	OSB076	$45,200	$32,000	$76,800	$5,400	$82,200
	OSB078	$18,200	$13,000	$30,900	$2,160	$33,000
	OSB117	$265,000	$190,000	$450,000	$45,300	$495,000
	OSB118	$2,180,000	$1,500,000	$3,710,000	$149,000	$3,860,000
	OSB119	$11,100,000	$7,800,000	$19,000,000	$225,000	$19,200,000
	OSB120	$65,200,000	$46,000,000	$111,000,000	$2,270,000	$113,000,000
	POL018	$224,000	$160,000	$379,000	$24,600	$404,000
	POL019	$1,880,000	$1,300,000	$3,200,000	$434,000	$3,630,000
	POL021	$149,000	$100,000	$253,000	$17,800	$271,000
	POL064	$45,200	$32,000	$76,800	$5,400	$82,200
	WAL001	$29,800,000	$21,000,000	$50,600,000	$3,530,000	$54,100,000
	WAL002	$206,000	$140,000	$351,000	$25,300	$376,000
	WAL004	$37,300,000	$26,000,000	$63,600,000	$1,230,000	$64,800,000
	WAL014	$395,000	$280,000	$672,000	$43,500	$715,000
	WAL016	$3,780	$2,600	$6,430	$647	$7,080
	WAL020	$1,670,000	$1,200,000	$2,860,000	$162,000	$3,020,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	WAL024	$97,000	$68,000	$165,000	$11,600	$176,000
	WAL034	$1,420,000	$990,000	$2,410,000	$96,600	$2,510,000
	WAL035	$1,450,000	$1,000,000	$2,460,000	$159,000	$2,620,000
	WAL036	$628,000	$440,000	$1,070,000	$72,800	$1,140,000
	WAL037	$226,000	$160,000	$385,000	$38,800	$424,000
	WAL046	$58,700	$41,000	$99,800	$7,020	$107,000
	WAL055	$38,500	$27,000	$65,400	$4,590	$70,000
	WAL056	$54,200	$38,000	$92,100	$6,480	$98,600
	WAL057	$22,700	$16,000	$38,600	$2,700	$41,300
	WAL058	$20,500	$14,000	$34,800	$2,430	$37,200
	WAL062	$43,000	$30,000	$73,000	$5,130	$78,100
	WAL064	$79,000	$55,000	$134,000	$9,450	$144,000
	WAL072	$18,200	$13,000	$30,900	$2,160	$33,000
	WAL073	$22,700	$16,000	$38,600	$2,700	$41,300
MIDGradSeg02	KLW061	$2,320,000	$1,600,000	$3,940,000	$301,000	$4,240,000
	KLW062	$356,000	$250,000	$605,000	$46,200	$651,000
	KLW070	$339,000	$240,000	$578,000	$23,200	$601,000
	KLW095	$137,000	$96,000	$233,000	$17,800	$251,000
	MG02-10	$38,500	$27,000	$65,500	$22,200	$87,700
	MG02-11	$22,500	$16,000	$38,200	$17,400	$55,500
	MG02-12	$6,360	$4,500	$10,800	$1,660	$12,500
MoonCrkSeg01	KLE061	$5,480	$3,800	$9,320	$496	$9,810
	MC01-2	$498,000	$350,000	$847,000	$174,000	$1,020,000
MoonCrkSeg02	KLE008	$109,000	$76,000	$185,000	$14,100	$199,000
	KLE014	$5,480	$3,800	$9,320	$496	$9,810
	KLE041	$120,000	$84,000	$204,000	$8,180	$212,000
	KLE063	$25,100	$18,000	$42,600	$3,260	$45,900
	KLE064	$21,700	$15,000	$36,900	$2,820	$39,700
	KLE065	$38,400	$27,000	$65,300	$4,990	$70,300
	MC02-2	$817,000	$570,000	$1,390,000	$266,000	$1,650,000
	MC02-3	$476,000	$330,000	$809,000	$148,000	$957,000
	MC02-4	$369,000	$260,000	$628,000	$120,000	$747,000
NMSeg	PIPENM	$1,560,000	$1,100,000	$2,650,000	$125,000	$2,780,000
NMSeg01	BUR051	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	BUR052	$39,400	$28,000	$66,900	$4,320	$71,200
	BUR053	$5,060,000	$3,500,000	$8,590,000	$494,000	$9,080,000
	BUR140	$364,000	$250,000	$619,000	$24,800	$644,000
	BUR160	$1,070,000	$750,000	$1,820,000	$245,000	$2,060,000
	NM01-1	$1,080,000	$750,000	$1,830,000	$344,000	$2,170,000
NMSeg02	BUR054	$5,660,000	$4,000,000	$9,610,000	$1,250,000	$10,900,000
	BUR055	$465,000	$330,000	$790,000	$58,900	$849,000
	BUR056	$2,230,000	$1,600,000	$3,790,000	$290,000	$4,080,000
	BUR058	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	BUR139	$295,000	$210,000	$501,000	$35,400	$536,000
	BUR170	$677,000	$470,000	$1,150,000	$1,190,000	$2,340,000
	BUR171	$489,000	$340,000	$830,000	$1,080,000	$1,910,000
	BUR172	$96,800	$68,000	$165,000	$11,600	$176,000
	NM02-1	$2,040,000	$1,400,000	$3,470,000	$655,000	$4,120,000
	OSB040	$615,000	$430,000	$1,050,000	$41,900	$1,090,000
	OSB044	$10,300,000	$7,200,000	$17,400,000	$922,000	$18,400,000
	OSB048	$12,600	$8,900	$21,500	$1,640	$23,100
	OSB056	$58,200	$41,000	$98,900	$3,960	$103,000
	OSB057	$473,000	$330,000	$804,000	$32,200	$837,000
	OSB058	$58,200	$41,000	$98,900	$3,960	$103,000
	OSB088	$13,600	$11,000	$24,600	$1,970	$26,600

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	OSB089	$20,300	$18,000	$38,400	$2,420	$40,800
NMSeg03	NM03-1	$921,000	$640,000	$1,570,000	$238,000	$1,800,000
NMSeg04	NM04-1	$1,860,000	$1,300,000	$3,160,000	$405,000	$3,560,000
	NM04-2	$741,000	$520,000	$1,260,000	$157,000	$1,420,000
	NM04-3	$5,130,000	$3,600,000	$8,730,000	$1,100,000	$9,830,000
	OSB032	$206,000	$140,000	$350,000	$22,700	$372,000
	OSB033	$166,000	$120,000	$283,000	$18,400	$301,000
	OSB038	$314,000	$220,000	$534,000	$34,600	$569,000
	OSB039	$758,000	$530,000	$1,290,000	$71,700	$1,360,000
	OSB052	$1,370,000	$960,000	$2,330,000	$273,000	$2,600,000
	OSB059	$1,200,000	$840,000	$2,040,000	$81,800	$2,120,000
	OSB060	$22,400	$16,000	$38,000	$2,590	$40,600
	OSB061	$132,000	$93,000	$225,000	$22,600	$248,000
	OSB082	$133,000	$93,000	$226,000	$14,600	$240,000
	OSB115	$76,700	$54,000	$130,000	$9,180	$140,000
	WAL006	$56,500	$40,000	$96,000	$6,750	$103,000
	WAL033	$920,000	$640,000	$1,560,000	$107,000	$1,670,000
PineCrkSeg01	HHWPPC01-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPPC01-2	$58,400	$41,000	$99,300	$7,600	$107,000
	MAS006	$4,190,000	$2,900,000	$7,130,000	$266,000	$7,390,000
	MAS007	$968,000	$680,000	$1,640,000	$1,150,000	$2,800,000
	MAS008	$473,000	$330,000	$804,000	$80,900	$884,000
	MAS009	$140,000	$99,000	$239,000	$24,100	$263,000
	MAS011	$146,000	$100,000	$248,000	$529,000	$777,000
	MAS012	$512,000	$360,000	$871,000	$1,190,000	$2,060,000
	MAS013	$88,800	$62,000	$151,000	$15,200	$166,000
	MAS014	$998,000	$700,000	$1,700,000	$2,380,000	$4,080,000
	MAS015	$296,000	$210,000	$503,000	$1,000,000	$1,510,000
	MAS016	$584,000	$410,000	$994,000	$604,000	$1,600,000
	MAS017	$1,690,000	$1,200,000	$2,870,000	$1,390,000	$4,260,000
	MAS018	$51,000	$36,000	$86,700	$8,730	$95,500
	MAS019	$18,900	$13,000	$32,100	$3,230	$35,400
	MAS020	$373,000	$260,000	$633,000	$1,030,000	$1,670,000
	MAS021	$560,000	$390,000	$951,000	$1,180,000	$2,130,000
	MAS022	$908,000	$640,000	$1,540,000	$155,000	$1,700,000
	MAS023	$18,900	$13,000	$32,100	$3,230	$35,400
	MAS027	$574,000	$400,000	$976,000	$65,300	$1,040,000
	MAS028	$204,000	$140,000	$347,000	$34,900	$382,000
	MAS029	$13,200	$9,300	$22,500	$2,260	$24,800
	MAS030	$68,600	$48,000	$117,000	$7,560	$124,000
	MAS031	$81,600	$57,000	$139,000	$14,000	$153,000
	MAS032	$1,520	$1,100	$2,570	$259	$2,830
	MAS033	$90,800	$64,000	$154,000	$15,500	$170,000
	MAS035	$152,000	$110,000	$257,000	$25,900	$283,000
	MAS036	$51,000	$36,000	$86,700	$8,730	$95,500
	MAS040	$50,200	$35,000	$85,400	$3,420	$88,800
	MAS041	$85,100	$60,000	$145,000	$5,800	$150,000
	MAS042	$39,300	$28,000	$66,900	$2,680	$69,500
	MAS043	$109,000	$76,000	$186,000	$7,430	$193,000
	MAS045	$109,000	$76,000	$186,000	$7,430	$193,000
	MAS046	$868,000	$610,000	$1,480,000	$59,100	$1,530,000
	MAS048	$402,000	$280,000	$684,000	$68,800	$752,000
	MAS049	$680,000	$480,000	$1,160,000	$116,000	$1,270,000
	MAS050	$812,000	$570,000	$1,380,000	$1,190,000	$2,570,000
	MAS052	$53,900	$38,000	$91,700	$5,940	$97,700

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MAS053	$3,780	$2,600	$6,430	$647	$7,080
	MAS054	$393,000	$280,000	$669,000	$574,000	$1,240,000
	MAS055	$3,780	$2,600	$6,430	$647	$7,080
	MAS057	$3,780	$2,600	$6,430	$647	$7,080
	MAS065	$3,780	$2,600	$6,430	$647	$7,080
	MAS068	$36,200	$25,000	$61,500	$4,320	$65,800
	MAS072	$3,780	$2,600	$6,430	$647	$7,080
	MAS078	$364,000	$250,000	$617,000	$580,000	$1,200,000
	MAS079	$585,000	$410,000	$994,000	$51,300	$1,050,000
	MAS083	$908,000	$640,000	$1,540,000	$102,000	$1,650,000
	MAS084	$567,000	$400,000	$964,000	$97,000	$1,060,000
PineCrkSeg02	TWI002	$109,000	$76,000	$185,000	$18,600	$204,000
	TWI006	$90,800	$64,000	$154,000	$15,500	$170,000
	TWI008	$3,780	$2,600	$6,430	$647	$7,080
	TWI009	$123,000	$86,000	$208,000	$21,000	$229,000
	TWI011	$3,780	$2,600	$6,430	$647	$7,080
	TWI012	$72,500	$51,000	$123,000	$12,400	$136,000
	TWI013	$145,000	$100,000	$247,000	$24,800	$272,000
	TWI014	$113,000	$79,000	$193,000	$19,400	$212,000
	TWI018	$3,780	$2,600	$6,430	$647	$7,080
	TWI020	$3,780	$2,600	$6,430	$647	$7,080
	TWI027	$3,780	$2,600	$6,430	$647	$7,080
	TWI029	$3,780	$2,600	$6,430	$647	$7,080
	TWI030	$3,780	$2,600	$6,430	$647	$7,080
PineCrkSeg03	KLW075	$322,000	$230,000	$547,000	$55,100	$602,000
	KLW077	$208,000	$150,000	$355,000	$35,700	$391,000
	KLW079	$181,000	$130,000	$308,000	$31,000	$339,000
	KLW082	$154,000	$110,000	$262,000	$26,400	$289,000
	KLW083	$264,000	$180,000	$447,000	$45,000	$492,000
	KLW085	$273,000	$190,000	$463,000	$46,600	$509,000
	MAS003	$980,000	$690,000	$1,670,000	$226,000	$1,890,000
	PC03-1	$1,540,000	$1,100,000	$2,620,000	$372,000	$2,990,000
	PC03-2	$1,340,000	$940,000	$2,270,000	$302,000	$2,580,000
	PC03-3	$575,000	$400,000	$978,000	$148,000	$1,130,000
UpperSFCDRSeg	PIPEUG	$11,800,000	$8,200,000	$20,000,000	$940,000	$20,900,000
UpperSFCDRSeg01	HHWPUG01-1	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-2	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-3	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-4	$58,400	$41,000	$99,300	$7,600	$107,000
	HHWPUG01-5	$58,400	$41,000	$99,300	$7,600	$107,000
	LOK001	$109,000	$76,000	$185,000	$14,100	$199,000
	LOK002	$107,000	$75,000	$182,000	$13,900	$196,000
	LOK004	$1,690,000	$1,200,000	$2,870,000	$1,410,000	$4,280,000
	LOK005	$15,200	$11,000	$25,800	$1,970	$27,800
	LOK006	$63,700	$45,000	$108,000	$7,020	$115,000
	LOK007	$22,800	$16,000	$38,700	$2,960	$41,700
	LOK008	$93,200	$65,000	$158,000	$10,300	$169,000
	LOK009	$418,000	$290,000	$710,000	$71,400	$781,000
	LOK010	$34,300	$24,000	$58,400	$3,780	$62,200
	LOK011	$4,670,000	$4,600,000	$9,270,000	$386,000	$9,660,000
	LOK017	$843,000	$590,000	$1,430,000	$98,000	$1,530,000
	LOK024	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	LOK048	$22,800	$16,000	$38,700	$2,960	$41,700
	LOK050	$246,000	$170,000	$418,000	$42,000	$460,000
	LOK051	$161,000	$110,000	$274,000	$20,900	$295,000

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	LOK053	$26,100	$18,000	$44,400	$3,400	$47,800
	MUL001	$1,430,000	$1,000,000	$2,420,000	$244,000	$2,670,000
	MUL002	$435,000	$300,000	$739,000	$74,400	$814,000
	MUL004	$202,000	$140,000	$342,000	$22,100	$364,000
	MUL006	$179,000	$130,000	$304,000	$19,700	$324,000
	MUL007	$80,100	$56,000	$136,000	$10,400	$147,000
	MUL008	$330,000	$230,000	$560,000	$36,200	$596,000
	MUL009	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL012	$2,190,000	$1,600,000	$3,800,000	$199,000	$4,000,000
	MUL013	$44,700	$31,000	$76,000	$5,810	$81,800
	MUL014	$1,190,000	$1,200,000	$2,420,000	$76,000	$2,500,000
	MUL015	$787,000	$550,000	$1,340,000	$102,000	$1,440,000
	MUL018	$273,000	$190,000	$463,000	$46,600	$509,000
	MUL019	$6,560,000	$4,800,000	$11,400,000	$803,000	$12,200,000
	MUL020	$7,830,000	$5,500,000	$13,300,000	$646,000	$14,000,000
	MUL021	$296,000	$210,000	$505,000	$32,700	$537,000
	MUL022	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL023	$1,090,000	$760,000	$1,860,000	$1,290,000	$3,150,000
	MUL027	$396,000	$280,000	$673,000	$570,000	$1,240,000
	MUL028	$1,410,000	$990,000	$2,400,000	$1,220,000	$3,620,000
	MUL029	$386,000	$270,000	$656,000	$66,000	$722,000
	MUL030	$88,300	$62,000	$150,000	$9,720	$160,000
	MUL031	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL033	$300,000	$210,000	$509,000	$51,200	$560,000
	MUL037	$9,480,000	$6,600,000	$16,100,000	$710,000	$16,800,000
	MUL038	$924,000	$650,000	$1,570,000	$117,000	$1,690,000
	MUL042	$264,000	$180,000	$447,000	$45,000	$492,000
	MUL043	$332,000	$230,000	$563,000	$56,700	$620,000
	MUL045	$522,000	$370,000	$887,000	$89,300	$976,000
	MUL047	$56,400	$39,000	$95,900	$6,210	$102,000
	MUL048	$404,000	$280,000	$687,000	$69,100	$756,000
	MUL049	$25,300	$18,000	$43,000	$3,290	$46,300
	MUL051	$294,000	$210,000	$500,000	$32,400	$533,000
	MUL052	$711,000	$500,000	$1,210,000	$1,200,000	$2,410,000
	MUL053	$266,000	$190,000	$452,000	$34,600	$487,000
	MUL054	$79,200	$56,000	$135,000	$10,300	$145,000
	MUL056	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL057	$66,600	$47,000	$113,000	$8,660	$122,000
	MUL058	$23,400,000	$16,000,000	$39,700,000	$2,250,000	$42,000,000
	MUL059	$427,000	$300,000	$725,000	$73,000	$798,000
	MUL060	$51,500	$36,000	$87,600	$5,670	$93,300
	MUL063	$51,500	$36,000	$87,600	$5,670	$93,300
	MUL065	$76,100	$53,000	$129,000	$8,370	$138,000
	MUL071	$1,830,000	$1,300,000	$3,110,000	$220,000	$3,330,000
	MUL073	$174,000	$120,000	$296,000	$22,600	$319,000
	MUL081	$178,000	$120,000	$302,000	$20,500	$323,000
	MUL083	$157,000	$110,000	$267,000	$17,300	$284,000
	MUL103	$217,000	$150,000	$369,000	$25,400	$394,000
	MUL119	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL120	$77,000	$54,000	$131,000	$9,180	$140,000
	MUL129	$272,000	$190,000	$463,000	$30,000	$493,000
	MUL131	$125,000	$87,000	$212,000	$21,300	$233,000
	MUL132	$34,100	$24,000	$57,900	$5,820	$63,700
	MUL135	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL136	$10,100	$7,100	$17,200	$1,320	$18,500

TABLE D-39

Summary of Total Estimated Costs by Site, Alternative 3+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL139	$3,780	$2,600	$6,430	$647	$7,080
	MUL141	$135,000	$94,000	$229,000	$15,600	$244,000
	MUL142	$478,000	$330,000	$812,000	$55,500	$868,000
	MUL145	$58,600	$41,000	$99,600	$6,790	$106,000
	MUL146	$427,000	$300,000	$725,000	$35,400	$761,000
	MUL149	$78,800	$55,000	$134,000	$9,140	$143,000
	MUL150	$211,000	$150,000	$358,000	$24,400	$383,000
	MUL153	$106,000	$74,000	$180,000	$12,300	$193,000
	THO020	$71,200	$50,000	$121,000	$7,830	$129,000
	UG01-10	$445,000	$310,000	$756,000	$148,000	$904,000
	UG01-11	$238,000	$170,000	$405,000	$64,000	$469,000
	UG01-12	$1,660,000	$1,200,000	$2,810,000	$508,000	$3,320,000
	UG01-13	$651,000	$460,000	$1,110,000	$232,000	$1,340,000
	UG01-14	$123,000	$86,000	$210,000	$44,000	$254,000
	UG01-15	$371,000	$260,000	$631,000	$147,000	$778,000
	UG01-16	$911,000	$640,000	$1,550,000	$244,000	$1,790,000
	UG01-17	$2,190,000	$1,500,000	$3,730,000	$569,000	$4,300,000
	UG01-18	$641,000	$450,000	$1,090,000	$256,000	$1,350,000
	UG01-19	$167,000	$120,000	$283,000	$47,500	$331,000
	UG01-4	$11,600	$8,100	$19,700	$3,480	$23,200
	UG01-5	$377,000	$260,000	$642,000	$131,000	$773,000
	UG01-6	$1,370,000	$960,000	$2,330,000	$323,000	$2,650,000
	UG01-7	$510,000	$360,000	$868,000	$147,000	$1,010,000
	UG01-8	$71,100	$50,000	$121,000	$29,800	$151,000
	UG01-9	$601,000	$420,000	$1,020,000	$198,000	$1,220,000
	WAL013	$83,400	$58,000	$142,000	$9,180	$151,000
	WAL038	$10,100,000	$7,100,000	$17,200,000	$690,000	$17,900,000
	WAL076	$771,000	$540,000	$1,310,000	$132,000	$1,440,000
	WAL077	$1,530,000	$1,100,000	$2,600,000	$104,000	$2,700,000

Notes:

This Table does not include CTP Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

NOTE: The above costs are presented rounded to three significant figures
NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prio to making specific financial decisions or establishing final budgets.

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
BigCrkSeg01	POL044	$5,480	$3,800	$9,320	$496	$9,810
	POL045	$16,000	$11,000	$27,200	$2,080	$29,300
	POL046	$15,200	$11,000	$25,800	$1,970	$27,800
	POL047	$18,500	$13,000	$31,500	$2,410	$33,900
	POL048	$14,300	$10,000	$24,300	$1,860	$26,200
	POL049	$11,000	$7,700	$18,700	$1,420	$20,100
	POL050	$18,500	$13,000	$31,500	$2,410	$33,900
	POL051	$33,400	$23,000	$56,800	$4,340	$61,100
	POL052	$126,000	$88,000	$214,000	$11,400	$226,000
BigCrkSeg02	POL024	$16,900	$12,000	$28,700	$2,190	$30,900
	POL025	$22,800	$16,000	$38,700	$2,960	$41,700
	POL026	$19,400	$14,000	$33,000	$2,520	$35,500
	POL027	$39,600	$28,000	$67,300	$5,150	$72,500
	POL028	$11,000	$7,700	$18,700	$1,420	$20,100
	POL036	$43,000	$30,000	$73,100	$5,590	$78,700
	POL037	$23,600	$17,000	$40,100	$3,070	$43,200
	POL038	$14,300	$10,000	$24,300	$1,860	$26,200
	POL039	$17,700	$12,000	$30,100	$2,300	$32,400
	POL040	$78,500	$55,000	$133,000	$10,200	$144,000
	POL041	$31,200	$22,000	$53,000	$4,050	$57,100
	POL042	$28,700	$20,000	$48,800	$3,730	$52,500
	POL043	$29,500	$21,000	$50,200	$3,840	$54,000
	POL053	$21,100	$15,000	$35,900	$2,740	$38,600
	POL054	$25,300	$18,000	$43,000	$3,290	$46,300
	POL056	$35,400	$25,000	$60,200	$4,600	$64,800
	POL062	$27,000	$19,000	$45,900	$3,510	$49,400
	POL063	$18,500	$13,000	$31,500	$2,410	$33,900
BigCrkSeg03	POL001	$223,000	$160,000	$380,000	$20,200	$400,000
	POL002	$279,000	$200,000	$475,000	$553,000	$1,030,000
	POL004	$330,000	$230,000	$560,000	$1,030,000	$1,590,000
	POL067	$572,000	$400,000	$973,000	$1,220,000	$2,190,000
	POL068	$5,480	$3,800	$9,320	$496	$9,810
	POL069	$24,400	$17,000	$41,500	$3,180	$44,700
	POL070	$35,100	$25,000	$59,600	$4,560	$64,200
	POL071	$23,400	$16,000	$39,800	$3,040	$42,800
BigCrkSeg04	BIG04-2	$239,000	$170,000	$406,000	$71,500	$477,000
	BIG04-3	$2,450,000	$1,700,000	$4,160,000	$572,000	$4,730,000
	KLE024	$19,500,000	$14,000,000	$33,200,000	$3,300,000	$36,500,000
	KLE025	$11,400,000	$8,000,000	$19,400,000	$1,020,000	$20,500,000
	KLE026	$2,410,000	$1,700,000	$4,100,000	$218,000	$4,320,000
	KLE027	$2,550,000	$1,800,000	$4,330,000	$231,000	$4,570,000
	KLE029	$187,000	$130,000	$318,000	$24,300	$342,000
	KLE047	$121,000	$85,000	$206,000	$8,230	$214,000
	KLE053	$5,390,000	$3,800,000	$9,160,000	$487,000	$9,650,000
	KLE054	$4,880,000	$3,400,000	$8,300,000	$1,590,000	$9,890,000
	KLE071	$1,780,000	$1,200,000	$3,030,000	$121,000	$3,150,000
	KLE073	$3,640,000	$2,500,000	$6,190,000	$248,000	$6,440,000
	POL005	$56,800	$40,000	$96,500	$7,380	$104,000
	POL006	$31,700	$22,000	$53,900	$4,120	$58,000
	POL008	$223,000	$160,000	$380,000	$20,200	$400,000
	POL010	$125,000	$87,000	$212,000	$11,300	$224,000
	POL011	$85,400	$60,000	$145,000	$7,730	$153,000
	POL022	$274,000	$190,000	$465,000	$540,000	$1,010,000
	POL023	$50,100	$35,000	$85,200	$6,510	$91,700
	POL066	$5,480	$3,800	$9,320	$496	$9,810
	POL075	$33,400	$23,000	$56,800	$4,340	$61,100
CCSeg	PIPECC	$7,400,000	$5,200,000	$12,600,000	$592,000	$13,200,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
CCSeg01	BUR102	$120,000	$84,000	$204,000	$15,600	$219,000
	BUR105	$123,000	$86,000	$209,000	$21,000	$230,000
	BUR109	$588,000	$430,000	$1,020,000	$93,900	$1,120,000
	BUR110	$24,400	$17,000	$41,500	$3,180	$44,700
	BUR182	$13,500	$9,400	$22,900	$1,750	$24,700
	BUR183	$18,500	$13,000	$31,500	$2,410	$33,900
	BUR184	$17,700	$12,000	$30,100	$2,300	$32,400
	BUR185	$3,780	$2,600	$6,430	$647	$7,080
	BUR186	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR187	$3,780	$2,600	$6,430	$647	$7,080
	BUR188	$36,200	$25,000	$61,600	$4,710	$66,300
	THO012	$27,800	$20,000	$47,300	$3,620	$50,900
	THO013	$29,500	$21,000	$50,200	$3,840	$54,000
	THO014	$23,600	$17,000	$40,100	$3,070	$43,200
	THO015	$34,600	$24,000	$58,800	$4,490	$63,300
	THO016	$11,000	$7,700	$18,700	$1,420	$20,100
	THO017	$45,500	$32,000	$77,400	$5,920	$83,300
	THO018	$16,900	$12,000	$28,700	$2,190	$30,900
	THO023	$3,780	$2,600	$6,430	$647	$7,080
CCSeg02	BUR100	$21,100	$15,000	$35,900	$2,740	$38,600
	BUR106	$21,100	$15,000	$35,900	$2,740	$38,600
	BUR107	$2,690,000	$1,900,000	$4,600,000	$455,000	$5,060,000
	BUR130	$56,700	$40,000	$96,400	$9,700	$106,000
	BUR131	$37,900	$27,000	$64,500	$4,930	$69,400
	BUR132	$1,740,000	$1,200,000	$2,950,000	$298,000	$3,250,000
	BUR133	$100,000	$70,000	$170,000	$17,100	$187,000
	BUR134	$273,000	$190,000	$463,000	$46,600	$509,000
	BUR135	$3,780	$2,600	$6,430	$647	$7,080
	BUR138	$48,900	$34,000	$83,100	$6,360	$89,500
	BUR145	$1,060,000	$740,000	$1,800,000	$181,000	$1,980,000
	BUR150	$893,000	$620,000	$1,520,000	$80,800	$1,600,000
	BUR151	$148,000	$100,000	$252,000	$19,300	$271,000
	BUR153	$1,270,000	$890,000	$2,170,000	$86,700	$2,250,000
	CC02-1	$1,600,000	$1,100,000	$2,720,000	$374,000	$3,100,000
CCSeg03	BUR085	$537,000	$380,000	$913,000	$1,200,000	$2,110,000
	BUR086	$141,000	$99,000	$240,000	$18,300	$258,000
	BUR087	$543,000	$400,000	$945,000	$86,200	$1,030,000
	BUR088	$70,000	$71,000	$141,000	$5,330	$147,000
	BUR089	$3,780	$2,600	$6,430	$647	$7,080
	BUR090	$1,860,000	$1,300,000	$3,170,000	$252,000	$3,420,000
	BUR091	$94,400	$88,000	$183,000	$8,510	$191,000
	BUR092	$16,000	$11,000	$27,200	$2,080	$29,300
	BUR099	$87,700	$84,000	$171,000	$7,630	$179,000
	BUR101	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR146	$1,860,000	$1,300,000	$3,160,000	$126,000	$3,280,000
	BUR149	$197,000	$140,000	$334,000	$33,600	$368,000
	BUR165	$17,700	$12,000	$30,100	$2,300	$32,400
	BUR166	$3,780	$2,600	$6,430	$647	$7,080
	BUR167	$35,400	$25,000	$60,200	$4,600	$64,800
	BUR179	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR180	$104,000	$73,000	$177,000	$17,800	$195,000
CCSeg04	BUR063	$159,000	$110,000	$271,000	$20,700	$292,000
	BUR064	$34,600	$24,000	$58,800	$4,490	$63,300
	BUR065	$85,100	$60,000	$145,000	$11,100	$156,000
	BUR066	$192,000	$130,000	$326,000	$17,300	$343,000
	BUR067	$10,600,000	$7,800,000	$18,400,000	$932,000	$19,300,000
	BUR068	$328,000	$230,000	$559,000	$29,700	$588,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	BUR069	$88,500	$62,000	$151,000	$11,500	$162,000
	BUR070	$237,000	$170,000	$403,000	$30,800	$434,000
	BUR071	$166,000	$120,000	$282,000	$21,600	$304,000
	BUR072	$392,000	$270,000	$666,000	$35,400	$701,000
	BUR073	$3,450,000	$2,400,000	$5,870,000	$312,000	$6,180,000
	BUR074	$145,000	$100,000	$246,000	$18,800	$265,000
	BUR075	$244,000	$170,000	$414,000	$27,900	$442,000
	BUR076	$9,270	$6,500	$15,800	$1,210	$17,000
	BUR093	$11,800	$8,300	$20,100	$1,530	$21,600
	BUR094	$118,000	$83,000	$201,000	$15,300	$216,000
	BUR095	$18,500	$13,000	$31,500	$2,410	$33,900
	BUR096	$135,000	$96,000	$230,000	$17,600	$248,000
	BUR097	$952,000	$990,000	$1,940,000	$63,000	$2,000,000
	BUR098	$2,420,000	$2,000,000	$4,450,000	$208,000	$4,660,000
	BUR111	$20,200	$14,000	$34,400	$2,630	$37,000
	BUR112	$181,000	$150,000	$330,000	$19,800	$350,000
	BUR113	$22,800	$16,000	$38,700	$2,960	$41,700
	BUR114	$169,000	$140,000	$309,000	$18,100	$327,000
	BUR115	$49,700	$35,000	$84,500	$6,470	$91,000
	BUR116	$27,800	$20,000	$47,300	$3,620	$50,900
	BUR117	$4,020,000	$2,800,000	$6,840,000	$363,000	$7,210,000
	BUR118	$904,000	$630,000	$1,540,000	$81,800	$1,620,000
	BUR119	$175,000	$120,000	$298,000	$22,800	$321,000
	BUR120	$78,400	$55,000	$133,000	$10,200	$144,000
	BUR121	$3,510,000	$2,700,000	$6,220,000	$297,000	$6,520,000
	BUR122	$739,000	$520,000	$1,260,000	$66,900	$1,320,000
	BUR123	$83,500	$81,000	$164,000	$7,080	$171,000
	BUR124	$154,000	$130,000	$285,000	$16,300	$301,000
	BUR125	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR126	$39,600	$28,000	$67,300	$5,150	$72,500
	BUR127	$14,300	$10,000	$24,300	$1,860	$26,200
	BUR128	$3,090,000	$2,200,000	$5,320,000	$341,000	$5,660,000
	BUR129	$214,000	$170,000	$386,000	$18,300	$404,000
	BUR141	$800,000	$560,000	$1,360,000	$54,500	$1,420,000
	BUR142	$2,120,000	$1,500,000	$3,600,000	$192,000	$3,790,000
	BUR143	$1,160,000	$820,000	$1,980,000	$79,300	$2,060,000
	BUR144	$1,070,000	$750,000	$1,820,000	$96,600	$1,910,000
	BUR174	$427,000	$300,000	$726,000	$55,500	$782,000
	BUR175	$21,100	$15,000	$35,900	$2,740	$38,600
	BUR176	$5,480	$3,800	$9,320	$496	$9,810
	BUR177	$5,480	$3,800	$9,320	$496	$9,810
	BUR178	$302,000	$210,000	$512,000	$27,300	$540,000
	BUR189	$5,480	$3,800	$9,320	$496	$9,810
	BUR190	$312,000	$330,000	$641,000	$14,600	$656,000
	BUR191	$131,000	$92,000	$223,000	$17,000	$240,000
	BUR192	$824,000	$580,000	$1,400,000	$74,600	$1,480,000
	BUR193	$63,200	$44,000	$108,000	$8,220	$116,000
	BUR194	$58,200	$41,000	$98,900	$7,560	$106,000
	BUR195	$35,400	$25,000	$60,200	$4,600	$64,800
	BUR198	$114,000	$80,000	$194,000	$14,800	$209,000
	BUR199	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR200	$19,400	$14,000	$33,000	$2,520	$35,500
	BUR202	$9,270	$6,500	$15,800	$1,210	$17,000
	BUR203	$10,100	$7,100	$17,200	$1,320	$18,500
	BUR204	$5,480	$3,800	$9,320	$496	$9,810
	CC04-1	$7,140,000	$5,000,000	$12,100,000	$1,540,000	$13,700,000
CCSeg05	CC05-1	$21,000,000	$15,000,000	$35,700,000	$3,820,000	$39,600,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	CC05-2	$6,890,000	$4,800,000	$11,700,000	$1,360,000	$13,100,000
	OSB047	$618,000	$430,000	$1,050,000	$42,100	$1,090,000
	WAL009	$69,300,000	$48,000,000	$118,000,000	$6,000,000	$124,000,000
	WAL010	$546,000	$380,000	$929,000	$37,200	$966,000
	WAL011	$638,000	$450,000	$1,080,000	$50,500	$1,140,000
	WAL039	$342,000	$240,000	$582,000	$31,000	$613,000
	WAL040	$656,000	$460,000	$1,110,000	$44,600	$1,160,000
	WAL041	$1,310,000	$920,000	$2,230,000	$89,200	$2,320,000
	WAL042	$16,700,000	$12,000,000	$28,400,000	$1,510,000	$29,900,000
	WAL081	$156,000	$110,000	$266,000	$14,100	$280,000
MIDGradSeg	PIPEMG	$12,600,000	$8,800,000	$21,400,000	$1,010,000	$22,400,000
MIDGradSeg01	KLE004	$29,500	$21,000	$50,200	$3,840	$54,000
	KLE005	$54,000	$38,000	$91,800	$7,010	$98,800
	KLE006	$115,000	$81,000	$196,000	$15,000	$211,000
	KLE011	$2,240,000	$1,600,000	$3,820,000	$203,000	$4,020,000
	KLE016	$5,480	$3,800	$9,320	$496	$9,810
	KLE020	$986,000	$690,000	$1,680,000	$89,200	$1,770,000
	KLE021	$5,480	$3,800	$9,320	$496	$9,810
	KLE022	$88,500	$62,000	$151,000	$11,500	$162,000
	KLE023	$5,480	$3,800	$9,320	$496	$9,810
	KLE032	$23,600	$17,000	$40,100	$3,070	$43,200
	KLE033	$685,000	$480,000	$1,160,000	$62,000	$1,230,000
	KLE034	$602,000	$420,000	$1,020,000	$54,500	$1,080,000
	KLE035	$4,970,000	$3,500,000	$8,460,000	$516,000	$8,970,000
	KLE036	$58,200	$41,000	$98,900	$7,560	$106,000
	KLE038	$307,000	$220,000	$522,000	$39,900	$562,000
	KLE039	$959,000	$670,000	$1,630,000	$86,700	$1,720,000
	KLE040	$4,480,000	$3,300,000	$7,760,000	$325,000	$8,080,000
	KLE042	$2,180,000	$1,500,000	$3,700,000	$156,000	$3,860,000
	KLE048	$16,400,000	$12,000,000	$28,000,000	$666,000	$28,700,000
	KLE049	$14,800,000	$11,000,000	$25,400,000	$638,000	$26,000,000
	KLE051	$5,480	$3,800	$9,320	$496	$9,810
	KLE056	$30,300	$21,000	$51,500	$3,950	$55,500
	KLE057	$15,200	$11,000	$25,800	$1,970	$27,800
	KLE058	$19,400	$14,000	$33,000	$2,520	$35,500
	KLE059	$11,800	$8,300	$20,100	$1,530	$21,600
	KLE060	$20,200	$14,000	$34,400	$2,630	$37,000
	KLE062	$1,220,000	$860,000	$2,080,000	$101,000	$2,180,000
	KLE066	$5,480	$3,800	$9,320	$496	$9,810
	KLE067	$1,030,000	$720,000	$1,750,000	$1,080,000	$2,830,000
	KLE068	$384,000	$270,000	$652,000	$34,700	$686,000
	KLE069	$35,600	$25,000	$60,500	$3,220	$63,700
	KLE070	$5,480	$3,800	$9,320	$496	$9,810
	KLE074	$2,070,000	$1,400,000	$3,520,000	$254,000	$3,780,000
	KLE075	$110,000	$77,000	$186,000	$9,910	$196,000
	MG01-1	$217,000	$150,000	$368,000	$59,300	$428,000
	MG01-10	$3,560,000	$2,500,000	$6,040,000	$659,000	$6,700,000
	MG01-11	$389,000	$270,000	$662,000	$96,100	$758,000
	MG01-12	$460,000	$320,000	$782,000	$110,000	$891,000
	MG01-13	$5,180,000	$3,600,000	$8,810,000	$979,000	$9,790,000
	MG01-14	$692,000	$480,000	$1,180,000	$138,000	$1,310,000
	MG01-15	$3,070,000	$2,100,000	$5,220,000	$589,000	$5,810,000
	MG01-16	$1,630,000	$1,100,000	$2,770,000	$314,000	$3,080,000
	MG01-17	$4,570,000	$3,200,000	$7,780,000	$871,000	$8,650,000
	MG01-18	$1,810,000	$1,300,000	$3,080,000	$350,000	$3,430,000
	MG01-2	$264,000	$180,000	$448,000	$63,100	$511,000
	MG01-3	$847,000	$590,000	$1,440,000	$187,000	$1,630,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MG01-4	$1,430,000	$1,000,000	$2,430,000	$323,000	$2,750,000
	MG01-5	$987,000	$690,000	$1,680,000	$196,000	$1,870,000
	MG01-6	$5,770,000	$4,000,000	$9,810,000	$1,110,000	$10,900,000
	MG01-7	$1,570,000	$1,100,000	$2,660,000	$358,000	$3,020,000
	MG01-8	$7,550,000	$5,300,000	$12,800,000	$1,400,000	$14,200,000
	MG01-9	$454,000	$320,000	$771,000	$91,600	$863,000
	MUL085	$1,110,000	$780,000	$1,880,000	$1,680,000	$3,560,000
	MUL086	$822,000	$580,000	$1,400,000	$74,300	$1,470,000
	MUL087	$31,200	$22,000	$53,000	$4,050	$57,100
	OSB024	$54,800	$38,000	$93,200	$7,120	$100,000
	OSB025	$328,000	$230,000	$559,000	$29,700	$588,000
	OSB026	$65,800	$46,000	$112,000	$8,550	$120,000
	OSB027	$100,000	$70,000	$170,000	$13,000	$183,000
	OSB028	$9,270	$6,500	$15,800	$1,210	$17,000
	OSB030	$5,480	$3,800	$9,320	$496	$9,810
	OSB065	$103,000,000	$72,000,000	$174,000,000	$3,550,000	$178,000,000
	OSB070	$849,000	$590,000	$1,440,000	$76,800	$1,520,000
	OSB071	$27,000	$19,000	$45,900	$3,510	$49,400
	OSB072	$5,480	$3,800	$9,320	$496	$9,810
	OSB073	$602,000	$420,000	$1,020,000	$54,500	$1,080,000
	OSB074	$524,000	$370,000	$890,000	$1,190,000	$2,080,000
	OSB075	$5,480	$3,800	$9,320	$496	$9,810
	OSB076	$154,000	$110,000	$262,000	$530,000	$792,000
	OSB078	$5,480	$3,800	$9,320	$496	$9,810
	OSB079	$13,500	$9,400	$22,900	$1,750	$24,700
	OSB080	$173,000	$120,000	$295,000	$533,000	$828,000
	OSB117	$384,000	$270,000	$652,000	$34,700	$686,000
	OSB118	$2,180,000	$1,500,000	$3,710,000	$149,000	$3,860,000
	OSB119	$22,800,000	$16,000,000	$38,700,000	$1,020,000	$39,700,000
	OSB120	$72,200,000	$51,000,000	$123,000,000	$2,740,000	$126,000,000
	POL015	$27,000	$19,000	$45,900	$3,510	$49,400
	POL016	$25,300	$18,000	$43,000	$3,290	$46,300
	POL017	$21,100	$15,000	$35,900	$2,740	$38,600
	POL018	$602,000	$420,000	$1,020,000	$54,500	$1,080,000
	POL019	$5,480,000	$3,800,000	$9,320,000	$496,000	$9,810,000
	POL020	$16,000	$11,000	$27,200	$2,080	$29,300
	POL021	$5,480	$3,800	$9,320	$496	$9,810
	POL029	$13,500	$9,400	$22,900	$1,750	$24,700
	POL030	$40,500	$28,000	$68,800	$5,260	$74,100
	POL031	$36,200	$25,000	$61,600	$4,710	$66,300
	POL032	$19,400	$14,000	$33,000	$2,520	$35,500
	POL033	$19,400	$14,000	$33,000	$2,520	$35,500
	POL034	$69,100	$48,000	$118,000	$8,990	$126,000
	POL035	$165,000	$120,000	$281,000	$21,500	$303,000
	POL055	$37,900	$27,000	$64,500	$4,930	$69,400
	POL057	$15,200	$11,000	$25,800	$1,970	$27,800
	POL058	$19,400	$14,000	$33,000	$2,520	$35,500
	POL059	$22,800	$16,000	$38,700	$2,960	$41,700
	POL060	$17,700	$12,000	$30,100	$2,300	$32,400
	POL061	$32,000	$22,000	$54,400	$4,160	$58,600
	POL064	$5,480	$3,800	$9,320	$496	$9,810
	POL065	$17,700	$12,000	$30,100	$2,300	$32,400
	POL077	$16,900	$12,000	$28,700	$2,190	$30,900
	POL078	$13,500	$9,400	$22,900	$1,750	$24,700
	POL079	$15,200	$11,000	$25,800	$1,970	$27,800
	POL080	$13,500	$9,400	$22,900	$1,750	$24,700
	POL081	$18,500	$13,000	$31,500	$2,410	$33,900

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	POL082	$18,500	$13,000	$31,500	$2,410	$33,900
	POL083	$15,200	$11,000	$25,800	$1,970	$27,800
	POL084	$13,500	$9,400	$22,900	$1,750	$24,700
	POL085	$11,800	$8,300	$20,100	$1,530	$21,600
	POL086	$15,200	$11,000	$25,800	$1,970	$27,800
	POL087	$15,200	$11,000	$25,800	$1,970	$27,800
	POL088	$27,000	$19,000	$45,900	$3,510	$49,400
	POL089	$18,500	$13,000	$31,500	$2,410	$33,900
	POL090	$9,270	$6,500	$15,800	$1,210	$17,000
	POL091	$16,000	$11,000	$27,200	$2,080	$29,300
	POL092	$23,600	$17,000	$40,100	$3,070	$43,200
	WAL001	$29,800,000	$21,000,000	$50,600,000	$3,530,000	$54,100,000
	WAL002	$15,800	$11,000	$27,000	$2,260	$29,300
	WAL003	$277,000	$190,000	$471,000	$36,100	$507,000
	WAL004	$37,600,000	$27,000,000	$64,200,000	$1,250,000	$65,400,000
	WAL005	$28,700	$20,000	$48,800	$3,730	$52,500
	WAL014	$1,070,000	$750,000	$1,820,000	$96,600	$1,910,000
	WAL016	$5,480	$3,800	$9,320	$496	$9,810
	WAL017	$175,000	$120,000	$297,000	$22,700	$320,000
	WAL019	$24,400	$17,000	$41,500	$3,180	$44,700
	WAL020	$3,880,000	$2,700,000	$6,610,000	$349,000	$6,960,000
	WAL021	$15,200	$11,000	$25,800	$1,970	$27,800
	WAL022	$11,000	$7,700	$18,700	$1,420	$20,100
	WAL023	$13,500	$9,400	$22,900	$1,750	$24,700
	WAL024	$5,480	$3,800	$9,320	$496	$9,810
	WAL025	$16,900	$12,000	$28,700	$2,190	$30,900
	WAL026	$7,590	$5,300	$12,900	$986	$13,900
	WAL027	$76,700	$54,000	$130,000	$9,970	$140,000
	WAL028	$15,200	$11,000	$25,800	$1,970	$27,800
	WAL029	$30,300	$21,000	$51,500	$3,950	$55,500
	WAL034	$2,840,000	$2,000,000	$4,830,000	$193,000	$5,020,000
	WAL035	$3,840,000	$2,700,000	$6,520,000	$347,000	$6,860,000
	WAL036	$1,640,000	$1,100,000	$2,790,000	$112,000	$2,900,000
	WAL037	$328,000	$230,000	$559,000	$29,700	$588,000
	WAL046	$5,480	$3,800	$9,320	$496	$9,810
	WAL047	$18,500	$13,000	$31,500	$2,410	$33,900
	WAL048	$102,000	$71,000	$173,000	$13,300	$187,000
	WAL049	$95,300	$67,000	$162,000	$12,400	$174,000
	WAL050	$70,800	$50,000	$120,000	$9,210	$130,000
	WAL051	$54,000	$38,000	$91,800	$7,010	$98,800
	WAL052	$70,800	$50,000	$120,000	$9,210	$130,000
	WAL053	$27,000	$19,000	$45,900	$3,510	$49,400
	WAL054	$58,200	$41,000	$98,900	$7,560	$106,000
	WAL055	$5,480	$3,800	$9,320	$496	$9,810
	WAL056	$5,480	$3,800	$9,320	$496	$9,810
	WAL057	$5,480	$3,800	$9,320	$496	$9,810
	WAL058	$5,480	$3,800	$9,320	$496	$9,810
	WAL059	$35,400	$25,000	$60,200	$4,600	$64,800
	WAL060	$20,200	$14,000	$34,400	$2,630	$37,000
	WAL061	$32,000	$22,000	$54,400	$4,160	$58,600
	WAL062	$5,480	$3,800	$9,320	$496	$9,810
	WAL063	$24,400	$17,000	$41,500	$3,180	$44,700
	WAL064	$5,480	$3,800	$9,320	$496	$9,810
	WAL065	$31,200	$22,000	$53,000	$4,050	$57,100
	WAL066	$27,800	$20,000	$47,300	$3,620	$50,900
	WAL067	$58,200	$41,000	$98,900	$7,560	$106,000
	WAL070	$59,900	$42,000	$102,000	$7,780	$110,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	WAL071	$16,900	$12,000	$28,700	$2,190	$30,900
	WAL072	$5,480	$3,800	$9,320	$496	$9,810
	WAL073	$5,480	$3,800	$9,320	$496	$9,810
	WAL074	$21,900	$15,000	$37,200	$2,850	$40,100
MIDGradSeg02	KLW061	$2,320,000	$1,600,000	$3,940,000	$301,000	$4,240,000
	KLW062	$356,000	$250,000	$605,000	$46,200	$651,000
	KLW070	$339,000	$240,000	$578,000	$23,200	$601,000
	KLW071	$576,000	$400,000	$979,000	$74,900	$1,050,000
	KLW095	$137,000	$96,000	$233,000	$17,800	$251,000
	KLW123	$15,200	$11,000	$25,800	$1,970	$27,800
	KLW124	$61,800	$43,000	$105,000	$8,030	$113,000
	KLW125	$38,400	$27,000	$65,300	$4,990	$70,300
	KLW126	$21,900	$15,000	$37,200	$2,850	$40,100
	KLW127	$21,700	$15,000	$36,900	$2,820	$39,700
	KLW128	$212,000	$150,000	$360,000	$27,600	$388,000
	MAS070	$33,700	$24,000	$57,300	$4,380	$61,700
	MG02-10	$50,500	$35,000	$85,800	$13,100	$98,900
	MG02-11	$43,900	$31,000	$74,600	$11,400	$86,000
	MG02-12	$18,900	$13,000	$32,100	$4,920	$37,000
	KLE007	$104,000	$73,000	$177,000	$13,500	$190,000
	KLE061	$5,480	$3,800	$9,320	$496	$9,810
	MC01-2	$498,000	$350,000	$847,000	$174,000	$1,020,000
	KLE008	$109,000	$76,000	$185,000	$14,100	$199,000
	KLE009	$116,000	$81,000	$197,000	$15,100	$213,000
	KLE013	$88,500	$62,000	$151,000	$11,500	$162,000
	KLE014	$5,480	$3,800	$9,320	$496	$9,810
	KLE041	$120,000	$84,000	$204,000	$8,180	$212,000
	KLE063	$25,100	$18,000	$42,600	$3,260	$45,900
	KLE064	$21,700	$15,000	$36,900	$2,820	$39,700
	KLE065	$38,400	$27,000	$65,300	$4,990	$70,300
	MC02-2	$817,000	$570,000	$1,390,000	$192,000	$1,580,000
	MC02-3	$477,000	$330,000	$810,000	$116,000	$926,000
	MC02-4	$370,000	$260,000	$629,000	$87,600	$716,000
NMSeg	PIPENM	$1,560,000	$1,100,000	$2,650,000	$125,000	$2,780,000
NMSeg01	BUR051	$656,000	$460,000	$1,110,000	$1,210,000	$2,330,000
	BUR052	$75,600	$53,000	$129,000	$12,900	$142,000
	BUR053	$13,500,000	$9,500,000	$23,000,000	$3,370,000	$26,400,000
	BUR077	$96,100	$67,000	$163,000	$12,500	$176,000
	BUR081	$554,000	$390,000	$942,000	$1,200,000	$2,140,000
	BUR082	$35,400	$25,000	$60,200	$4,600	$64,800
	BUR083	$27,000	$19,000	$45,900	$3,510	$49,400
	BUR084	$22,800	$16,000	$38,700	$2,960	$41,700
	BUR140	$364,000	$250,000	$619,000	$24,800	$644,000
	NM01-1	$1,050,000	$730,000	$1,780,000	$283,000	$2,070,000
NMSeg02	BUR054	$8,440,000	$5,900,000	$14,400,000	$1,290,000	$15,600,000
	BUR055	$584,000	$410,000	$992,000	$48,300	$1,040,000
	BUR056	$8,030,000	$5,600,000	$13,700,000	$726,000	$14,400,000
	BUR057	$76,700	$54,000	$130,000	$9,970	$140,000
	BUR058	$584,000	$410,000	$993,000	$1,200,000	$2,200,000
	BUR059	$147,000	$100,000	$250,000	$19,100	$269,000
	BUR060	$180,000	$130,000	$306,000	$23,500	$330,000
	BUR061	$120,000	$84,000	$204,000	$15,600	$219,000
	BUR062	$57,300	$40,000	$97,400	$7,450	$105,000
	BUR170	$764,000	$530,000	$1,300,000	$1,190,000	$2,490,000
	BUR171	$340,000	$240,000	$577,000	$1,060,000	$1,640,000
	BUR196	$26,100	$18,000	$44,400	$3,400	$47,800
	BUR197	$38,800	$27,000	$65,900	$5,040	$70,900

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	BUR205	$54,800	$38,000	$93,200	$7,120	$100,000
	NM02-1	$1,990,000	$1,400,000	$3,390,000	$535,000	$3,920,000
	OSB040	$691,000	$480,000	$1,180,000	$47,100	$1,220,000
	OSB044	$10,700,000	$7,500,000	$18,200,000	$959,000	$19,100,000
	OSB045	$70,800	$50,000	$120,000	$9,210	$130,000
	OSB046	$29,500	$21,000	$50,200	$3,840	$54,000
	OSB048	$12,600	$8,900	$21,500	$1,640	$23,100
	OSB056	$58,200	$41,000	$98,900	$3,960	$103,000
	OSB057	$473,000	$330,000	$804,000	$32,200	$837,000
	OSB058	$58,200	$41,000	$98,900	$3,960	$103,000
	OSB088	$13,600	$11,000	$24,600	$1,970	$26,600
	OSB089	$20,300	$18,000	$38,400	$2,420	$40,800
NMSeg03	NM03-1	$994,000	$700,000	$1,690,000	$217,000	$1,910,000
	OSB041	$69,100	$48,000	$118,000	$8,990	$126,000
	OSB042	$16,000	$11,000	$27,200	$2,080	$29,300
	OSB043	$113,000	$79,000	$192,000	$14,700	$207,000
	OSB049	$46,400	$33,000	$78,900	$6,030	$84,900
	OSB081	$11,800	$8,300	$20,100	$1,530	$21,600
	OSB087	$8,430	$5,900	$14,300	$1,100	$15,400
NMSeg04	NM04-1	$1,860,000	$1,300,000	$3,160,000	$372,000	$3,530,000
	NM04-2	$735,000	$510,000	$1,250,000	$145,000	$1,390,000
	NM04-3	$5,090,000	$3,600,000	$8,670,000	$1,020,000	$9,680,000
	OSB031	$47,200	$33,000	$80,200	$6,140	$86,300
	OSB032	$548,000	$380,000	$932,000	$49,600	$981,000
	OSB033	$438,000	$310,000	$745,000	$39,600	$784,000
	OSB034	$25,300	$18,000	$43,000	$3,290	$46,300
	OSB035	$41,300	$29,000	$70,200	$5,370	$75,600
	OSB036	$21,100	$15,000	$35,900	$2,740	$38,600
	OSB037	$59,900	$42,000	$102,000	$7,780	$110,000
	OSB038	$849,000	$590,000	$1,440,000	$76,800	$1,520,000
	OSB039	$3,800,000	$2,700,000	$6,450,000	$432,000	$6,880,000
	OSB052	$5,480,000	$3,800,000	$9,320,000	$496,000	$9,810,000
	OSB055	$44,000	$32,000	$76,300	$5,930	$82,300
	OSB059	$1,200,000	$840,000	$2,040,000	$81,800	$2,120,000
	OSB060	$29,200	$20,000	$49,600	$1,980	$51,500
	OSB061	$192,000	$130,000	$326,000	$17,300	$343,000
	OSB082	$356,000	$250,000	$605,000	$32,200	$637,000
	OSB083	$64,900	$45,000	$110,000	$8,440	$119,000
	OSB114	$18,500	$13,000	$31,500	$2,410	$33,900
	OSB115	$5,480	$3,800	$9,320	$496	$9,810
	OSB116	$26,100	$18,000	$44,400	$3,400	$47,800
	WAL006	$5,480	$3,800	$9,320	$496	$9,810
	WAL033	$1,240,000	$870,000	$2,100,000	$84,300	$2,190,000
	WAL069	$20,200	$14,000	$34,400	$2,630	$37,000
	WAL075	$7,590	$5,300	$12,900	$986	$13,900
	WAL078	$22,800	$16,000	$38,700	$2,960	$41,700
PineCrkSeg01	MAS004	$403,000	$280,000	$685,000	$1,060,000	$1,750,000
	MAS005	$24,400	$17,000	$41,500	$3,180	$44,700
	MAS006	$1,150,000	$800,000	$1,950,000	$104,000	$2,060,000
	MAS007	$1,670,000	$1,200,000	$2,840,000	$1,220,000	$4,060,000
	MAS008	$685,000	$480,000	$1,160,000	$62,000	$1,230,000
	MAS009	$349,000	$240,000	$593,000	$547,000	$1,140,000
	MAS011	$146,000	$100,000	$248,000	$529,000	$777,000
	MAS012	$516,000	$360,000	$878,000	$1,190,000	$2,070,000
	MAS013	$129,000	$90,000	$219,000	$11,600	$230,000
	MAS014	$998,000	$700,000	$1,700,000	$2,380,000	$4,080,000
	MAS015	$304,000	$210,000	$517,000	$1,000,000	$1,520,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MAS016	$782,000	$550,000	$1,330,000	$586,000	$1,920,000
	MAS017	$2,220,000	$1,600,000	$3,770,000	$1,350,000	$5,120,000
	MAS018	$73,900	$52,000	$126,000	$6,690	$132,000
	MAS019	$27,400	$19,000	$46,600	$2,480	$49,100
	MAS020	$373,000	$260,000	$633,000	$1,030,000	$1,670,000
	MAS021	$426,000	$300,000	$724,000	$1,140,000	$1,870,000
	MAS022	$1,320,000	$920,000	$2,240,000	$119,000	$2,360,000
	MAS023	$27,400	$19,000	$46,600	$2,480	$49,100
	MAS025	$503,000	$350,000	$854,000	$1,190,000	$2,050,000
	MAS027	$192,000	$130,000	$326,000	$17,300	$343,000
	MAS028	$296,000	$210,000	$503,000	$26,800	$530,000
	MAS029	$168,000	$120,000	$285,000	$531,000	$817,000
	MAS030	$184,000	$130,000	$313,000	$16,700	$330,000
	MAS031	$118,000	$83,000	$201,000	$10,700	$212,000
	MAS032	$2,200	$1,500	$3,730	$198	$3,930
	MAS033	$132,000	$92,000	$224,000	$11,900	$236,000
	MAS034	$12,600	$8,900	$21,500	$1,640	$23,100
	MAS035	$220,000	$150,000	$373,000	$19,800	$393,000
	MAS036	$73,900	$52,000	$126,000	$6,690	$132,000
	MAS040	$50,200	$35,000	$85,400	$3,420	$88,800
	MAS041	$85,100	$60,000	$145,000	$5,800	$150,000
	MAS042	$39,300	$28,000	$66,900	$2,680	$69,500
	MAS043	$109,000	$76,000	$186,000	$7,430	$193,000
	MAS045	$109,000	$76,000	$186,000	$7,430	$193,000
	MAS046	$868,000	$610,000	$1,480,000	$59,100	$1,530,000
	MAS048	$583,000	$410,000	$990,000	$52,700	$1,040,000
	MAS049	$986,000	$690,000	$1,680,000	$89,200	$1,770,000
	MAS050	$970,000	$680,000	$1,650,000	$1,200,000	$2,850,000
	MAS051	$38,400	$27,000	$65,300	$4,990	$70,300
	MAS052	$145,000	$100,000	$246,000	$13,100	$259,000
	MAS053	$5,480	$3,800	$9,320	$496	$9,810
	MAS054	$483,000	$340,000	$821,000	$566,000	$1,390,000
	MAS055	$5,480	$3,800	$9,320	$496	$9,810
	MAS056	$31,700	$22,000	$53,900	$4,120	$58,000
	MAS057	$5,480	$3,800	$9,320	$496	$9,810
	MAS058	$25,300	$18,000	$43,000	$3,290	$46,300
	MAS059	$23,600	$17,000	$40,100	$3,070	$43,200
	MAS060	$45,100	$32,000	$76,700	$5,860	$82,600
	MAS061	$26,100	$18,000	$44,400	$3,400	$47,800
	MAS062	$38,400	$27,000	$65,300	$4,990	$70,300
	MAS063	$12,600	$8,900	$21,500	$1,640	$23,100
	MAS065	$5,480	$3,800	$9,320	$496	$9,810
	MAS067	$523,000	$370,000	$890,000	$1,190,000	$2,080,000
	MAS068	$5,480	$3,800	$9,320	$496	$9,810
	MAS069	$159,000	$110,000	$271,000	$20,700	$292,000
	MAS072	$5,480	$3,800	$9,320	$496	$9,810
	MAS075	$16,000	$11,000	$27,200	$2,080	$29,300
	MAS076	$37,900	$27,000	$64,500	$4,930	$69,400
	MAS077	$91,900	$64,000	$156,000	$11,900	$168,000
	MAS078	$364,000	$250,000	$617,000	$580,000	$1,200,000
	MAS079	$1,020,000	$720,000	$1,740,000	$92,400	$1,830,000
	MAS080	$36,200	$25,000	$61,600	$4,710	$66,300
	MAS082	$104,000	$73,000	$177,000	$13,500	$190,000
	MAS083	$1,020,000	$710,000	$1,730,000	$92,100	$1,820,000
	MAS084	$822,000	$580,000	$1,400,000	$74,300	$1,470,000
PineCrkSeg02	TWI001	$47,200	$33,000	$80,200	$6,140	$86,300
	TWI002	$158,000	$110,000	$268,000	$14,300	$283,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	TWI003	$13,500	$9,400	$22,900	$1,750	$24,700
	TWI004	$19,400	$14,000	$33,000	$2,520	$35,500
	TWI005	$25,300	$18,000	$43,000	$3,290	$46,300
	TWI006	$132,000	$92,000	$224,000	$11,900	$236,000
	TWI007	$41,800	$29,000	$71,000	$5,430	$76,400
	TWI008	$5,480	$3,800	$9,320	$496	$9,810
	TWI009	$178,000	$120,000	$302,000	$16,100	$318,000
	TWI010	$55,100	$39,000	$93,700	$7,160	$101,000
	TWI011	$5,480	$3,800	$9,320	$496	$9,810
	TWI012	$105,000	$74,000	$179,000	$9,520	$188,000
	TWI013	$211,000	$150,000	$358,000	$19,000	$377,000
	TWI014	$164,000	$120,000	$279,000	$14,900	$294,000
	TWI015	$53,400	$37,000	$90,800	$6,950	$97,800
	TWI016	$41,800	$29,000	$71,000	$5,430	$76,400
	TWI017	$22,800	$16,000	$38,700	$2,960	$41,700
	TWI018	$5,480	$3,800	$9,320	$496	$9,810
	TWI019	$55,100	$39,000	$93,700	$7,160	$101,000
	TWI020	$5,480	$3,800	$9,320	$496	$9,810
	TWI021	$18,500	$13,000	$31,500	$2,410	$33,900
	TWI022	$61,500	$43,000	$105,000	$8,000	$113,000
	TWI023	$42,200	$30,000	$71,700	$5,480	$77,200
	TWI024	$35,400	$25,000	$60,200	$4,600	$64,800
	TWI025	$25,300	$18,000	$43,000	$3,290	$46,300
	TWI026	$116,000	$81,000	$197,000	$15,100	$213,000
	TWI027	$5,480	$3,800	$9,320	$496	$9,810
	TWI028	$30,100	$21,000	$51,100	$3,910	$55,000
	TWI029	$5,480	$3,800	$9,320	$496	$9,810
	TWI030	$5,480	$3,800	$9,320	$496	$9,810
PineCrkSeg03	KLW072	$87,700	$61,000	$149,000	$11,400	$161,000
	KLW073	$230,000	$160,000	$391,000	$20,800	$412,000
	KLW075	$467,000	$330,000	$794,000	$42,200	$836,000
	KLW077	$302,000	$210,000	$514,000	$27,400	$541,000
	KLW079	$263,000	$180,000	$447,000	$23,800	$471,000
	KLW081	$166,000	$120,000	$281,000	$534,000	$815,000
	KLW082	$223,000	$160,000	$380,000	$20,200	$400,000
	KLW083	$381,000	$270,000	$647,000	$34,500	$682,000
	KLW084	$28,700	$20,000	$48,800	$3,730	$52,500
	KLW085	$395,000	$280,000	$670,000	$35,700	$706,000
	MAS001	$91,000	$64,000	$155,000	$11,800	$167,000
	MAS003	$590,000	$410,000	$1,000,000	$1,080,000	$2,090,000
	MAS064	$21,100	$15,000	$35,900	$2,740	$38,600
	MAS066	$5,480	$3,800	$9,320	$496	$9,810
	PC03-1	$1,540,000	$1,100,000	$2,620,000	$331,000	$2,950,000
	PC03-2	$1,280,000	$890,000	$2,170,000	$270,000	$2,440,000
	PC03-3	$576,000	$400,000	$979,000	$127,000	$1,110,000
UpperSFCDRSeg	PIPEUG	$11,800,000	$8,300,000	$20,100,000	$947,000	$21,100,000
UpperSFCDRSeg01	BUR136	$25,300	$18,000	$43,000	$3,290	$46,300
	BUR137	$27,000	$19,000	$45,900	$3,510	$49,400
	LOK001	$109,000	$76,000	$185,000	$14,100	$199,000
	LOK002	$107,000	$75,000	$182,000	$13,900	$196,000
	LOK003	$20,200	$14,000	$34,400	$2,630	$37,000
	LOK004	$2,200,000	$1,500,000	$3,750,000	$1,360,000	$5,110,000
	LOK005	$15,200	$11,000	$25,800	$1,970	$27,800
	LOK006	$171,000	$120,000	$290,000	$15,500	$306,000
	LOK007	$123,000	$86,000	$208,000	$21,000	$229,000
	LOK008	$242,000	$190,000	$434,000	$34,800	$469,000
	LOK009	$418,000	$290,000	$710,000	$71,400	$781,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	LOK010	$92,000	$64,000	$156,000	$8,330	$165,000
	LOK011	$4,670,000	$4,600,000	$9,270,000	$386,000	$9,660,000
	LOK012	$122,000	$86,000	$208,000	$15,900	$224,000
	LOK013	$108,000	$76,000	$184,000	$14,000	$198,000
	LOK014	$543,000	$380,000	$923,000	$1,200,000	$2,120,000
	LOK015	$10,100	$7,100	$17,200	$1,320	$18,500
	LOK016	$69,100	$48,000	$118,000	$8,990	$126,000
	LOK017	$1,020,000	$710,000	$1,730,000	$611,000	$2,340,000
	LOK018	$47,200	$33,000	$80,200	$6,140	$86,300
	LOK019	$254,000	$180,000	$432,000	$543,000	$975,000
	LOK020	$45,500	$32,000	$77,400	$5,920	$83,300
	LOK021	$96,100	$67,000	$163,000	$12,500	$176,000
	LOK022	$124,000	$87,000	$211,000	$16,100	$227,000
	LOK024	$614,000	$430,000	$1,040,000	$1,210,000	$2,250,000
	LOK025	$32,000	$22,000	$54,400	$4,160	$58,600
	LOK026	$28,700	$20,000	$48,800	$3,730	$52,500
	LOK027	$16,000	$11,000	$27,200	$2,080	$29,300
	LOK028	$541,000	$380,000	$920,000	$1,200,000	$2,120,000
	LOK041	$79,200	$56,000	$135,000	$10,300	$145,000
	LOK044	$127,000	$89,000	$216,000	$16,500	$232,000
	LOK045	$31,200	$22,000	$53,000	$4,050	$57,100
	LOK047	$191,000	$130,000	$324,000	$24,800	$349,000
	LOK048	$123,000	$86,000	$208,000	$21,000	$229,000
	LOK050	$356,000	$250,000	$605,000	$32,200	$637,000
	LOK051	$1,260,000	$880,000	$2,140,000	$114,000	$2,250,000
	LOK052	$26,100	$18,000	$44,400	$3,400	$47,800
	LOK053	$26,100	$18,000	$44,400	$3,400	$47,800
	LOK054	$11,000	$7,700	$18,700	$1,420	$20,100
	MUL001	$2,090,000	$1,500,000	$3,560,000	$190,000	$3,750,000
	MUL002	$630,000	$440,000	$1,070,000	$57,000	$1,130,000
	MUL003	$231,000	$160,000	$393,000	$30,000	$423,000
	MUL004	$539,000	$380,000	$916,000	$48,800	$965,000
	MUL005	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL006	$480,000	$340,000	$816,000	$43,400	$859,000
	MUL007	$80,100	$56,000	$136,000	$10,400	$147,000
	MUL008	$904,000	$630,000	$1,540,000	$81,800	$1,620,000
	MUL009	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL010	$27,000	$19,000	$45,900	$3,510	$49,400
	MUL011	$12,600	$8,900	$21,500	$1,640	$23,100
	MUL012	$4,310,000	$3,100,000	$7,390,000	$716,000	$8,110,000
	MUL013	$115,000	$100,000	$217,000	$11,100	$228,000
	MUL014	$1,260,000	$1,300,000	$2,540,000	$92,600	$2,630,000
	MUL015	$435,000	$300,000	$739,000	$74,400	$814,000
	MUL016	$46,400	$33,000	$78,900	$6,030	$84,900
	MUL017	$45,500	$32,000	$77,400	$5,920	$83,300
	MUL018	$395,000	$280,000	$670,000	$35,700	$706,000
	MUL019	$13,800,000	$9,900,000	$23,700,000	$1,310,000	$25,000,000
	MUL020	$7,830,000	$5,500,000	$13,300,000	$646,000	$14,000,000
	MUL021	$795,000	$560,000	$1,350,000	$72,000	$1,420,000
	MUL022	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL023	$1,360,000	$950,000	$2,310,000	$1,270,000	$3,580,000
	MUL024	$690,000	$480,000	$1,170,000	$1,220,000	$2,390,000
	MUL025	$85,100	$60,000	$145,000	$11,100	$156,000
	MUL026	$170,000	$120,000	$289,000	$22,100	$311,000
	MUL027	$679,000	$480,000	$1,160,000	$626,000	$1,780,000
	MUL028	$2,300,000	$1,600,000	$3,910,000	$1,430,000	$5,340,000
	MUL029	$386,000	$270,000	$656,000	$66,000	$722,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL030	$163,000	$110,000	$278,000	$27,900	$306,000
	MUL031	$154,000	$110,000	$262,000	$26,400	$289,000
	MUL032	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL033	$300,000	$210,000	$509,000	$51,200	$560,000
	MUL034	$73,500	$51,000	$125,000	$9,550	$134,000
	MUL035	$25,300	$18,000	$43,000	$3,290	$46,300
	MUL036	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL037	$9,520,000	$6,700,000	$16,200,000	$712,000	$16,900,000
	MUL038	$2,180,000	$1,500,000	$3,700,000	$197,000	$3,900,000
	MUL040	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL041	$314,000	$220,000	$534,000	$40,800	$575,000
	MUL042	$264,000	$180,000	$447,000	$45,000	$492,000
	MUL043	$332,000	$230,000	$563,000	$56,700	$620,000
	MUL045	$522,000	$370,000	$887,000	$89,300	$976,000
	MUL046	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL047	$104,000	$73,000	$177,000	$17,900	$195,000
	MUL048	$585,000	$410,000	$995,000	$52,900	$1,050,000
	MUL049	$25,300	$18,000	$43,000	$3,290	$46,300
	MUL050	$31,200	$22,000	$53,000	$4,050	$57,100
	MUL051	$544,000	$380,000	$925,000	$93,100	$1,020,000
	MUL052	$684,000	$480,000	$1,160,000	$1,210,000	$2,370,000
	MUL053	$2,050,000	$1,400,000	$3,490,000	$1,570,000	$5,060,000
	MUL054	$186,000	$130,000	$317,000	$538,000	$855,000
	MUL055	$220,000	$150,000	$374,000	$28,600	$403,000
	MUL056	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL057	$66,600	$47,000	$113,000	$8,660	$122,000
	MUL058	$23,400,000	$16,000,000	$39,700,000	$2,250,000	$42,000,000
	MUL059	$618,000	$430,000	$1,050,000	$55,900	$1,110,000
	MUL060	$138,000	$97,000	$235,000	$12,500	$247,000
	MUL061	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL062	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL063	$138,000	$97,000	$235,000	$12,500	$247,000
	MUL064	$47,200	$33,000	$80,200	$6,140	$86,300
	MUL065	$204,000	$140,000	$347,000	$18,400	$365,000
	MUL066	$79,200	$56,000	$135,000	$10,300	$145,000
	MUL067	$113,000	$79,000	$192,000	$14,700	$207,000
	MUL068	$30,300	$21,000	$51,500	$3,950	$55,500
	MUL069	$18,500	$13,000	$31,500	$2,410	$33,900
	MUL071	$78,200	$55,000	$133,000	$7,940	$141,000
	MUL072	$386,000	$270,000	$656,000	$1,050,000	$1,710,000
	MUL073	$174,000	$120,000	$296,000	$22,600	$319,000
	MUL074	$38,800	$27,000	$65,900	$5,040	$70,900
	MUL075	$25,300	$18,000	$43,000	$3,290	$46,300
	MUL076	$29,500	$21,000	$50,200	$3,840	$54,000
	MUL077	$20,200	$14,000	$34,400	$2,630	$37,000
	MUL078	$96,100	$67,000	$163,000	$12,500	$176,000
	MUL079	$75,000	$53,000	$128,000	$9,750	$137,000
	MUL080	$28,700	$20,000	$48,800	$3,730	$52,500
	MUL081	$393,000	$280,000	$668,000	$558,000	$1,230,000
	MUL082	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL083	$421,000	$290,000	$715,000	$38,100	$753,000
	MUL084	$95,300	$67,000	$162,000	$12,400	$174,000
	MUL103	$676,000	$470,000	$1,150,000	$1,210,000	$2,360,000
	MUL107	$11,000	$7,700	$18,700	$1,420	$20,100
	MUL108	$11,800	$8,300	$20,100	$1,530	$21,600
	MUL109	$14,300	$10,000	$24,300	$1,860	$26,200
	MUL110	$11,800	$8,300	$20,100	$1,530	$21,600

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	MUL111	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL112	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL113	$17,700	$12,000	$30,100	$2,300	$32,400
	MUL114	$18,500	$13,000	$31,500	$2,410	$33,900
	MUL115	$20,200	$14,000	$34,400	$2,630	$37,000
	MUL116	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL117	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL118	$27,000	$19,000	$45,900	$3,510	$49,400
	MUL119	$23,600	$17,000	$40,100	$3,070	$43,200
	MUL120	$15,300	$11,000	$26,100	$1,390	$27,500
	MUL121	$13,500	$9,400	$22,900	$1,750	$24,700
	MUL122	$17,700	$12,000	$30,100	$2,300	$32,400
	MUL123	$12,600	$8,900	$21,500	$1,640	$23,100
	MUL124	$15,200	$11,000	$25,800	$1,970	$27,800
	MUL125	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL126	$18,500	$13,000	$31,500	$2,410	$33,900
	MUL127	$19,400	$14,000	$33,000	$2,520	$35,500
	MUL128	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL129	$730,000	$510,000	$1,240,000	$66,000	$1,310,000
	MUL130	$149,000	$100,000	$253,000	$19,400	$272,000
	MUL131	$181,000	$130,000	$308,000	$16,400	$324,000
	MUL132	$49,300	$35,000	$83,900	$4,460	$88,300
	MUL133	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL134	$48,900	$34,000	$83,100	$6,360	$89,500
	MUL135	$3,780	$2,600	$6,430	$647	$7,080
	MUL136	$3,780	$2,600	$6,430	$647	$7,080
	MUL137	$30,300	$21,000	$51,500	$3,950	$55,500
	MUL138	$68,300	$48,000	$116,000	$8,880	$125,000
	MUL139	$3,780	$2,600	$6,430	$647	$7,080
	MUL140	$14,300	$10,000	$24,300	$1,860	$26,200
	MUL141	$351,000	$250,000	$597,000	$23,900	$621,000
	MUL142	$1,250,000	$870,000	$2,120,000	$85,000	$2,210,000
	MUL143	$30,300	$21,000	$51,500	$3,950	$55,500
	MUL144	$20,200	$14,000	$34,400	$2,630	$37,000
	MUL145	$153,000	$110,000	$260,000	$10,400	$270,000
	MUL146	$594,000	$420,000	$1,010,000	$102,000	$1,110,000
	MUL147	$16,000	$11,000	$27,200	$2,080	$29,300
	MUL148	$112,000	$78,000	$190,000	$14,500	$205,000
	MUL149	$206,000	$140,000	$350,000	$14,000	$364,000
	MUL150	$549,000	$390,000	$934,000	$37,400	$971,000
	MUL151	$21,100	$15,000	$35,900	$2,740	$38,600
	MUL152	$14,300	$10,000	$24,300	$1,860	$26,200
	MUL153	$277,000	$190,000	$470,000	$18,800	$489,000
	MUL154	$147,000	$100,000	$250,000	$19,100	$269,000
	MUL155	$32,000	$22,000	$54,400	$4,160	$58,600
	MUL156	$14,300	$10,000	$24,300	$1,860	$26,200
	MUL157	$9,270	$6,500	$15,800	$1,210	$17,000
	THO019	$28,700	$20,000	$48,800	$3,730	$52,500
	THO020	$190,000	$130,000	$324,000	$17,200	$341,000
	THO021	$25,300	$18,000	$43,000	$3,290	$46,300
	UG01-1	$14,200	$9,900	$24,100	$2,550	$26,700
	UG01-10	$426,000	$300,000	$724,000	$109,000	$833,000
	UG01-11	$238,000	$170,000	$405,000	$54,300	$459,000
	UG01-12	$2,740,000	$1,900,000	$4,660,000	$607,000	$5,260,000
	UG01-13	$1,090,000	$760,000	$1,860,000	$260,000	$2,120,000
	UG01-14	$120,000	$84,000	$203,000	$33,600	$237,000
	UG01-15	$371,000	$260,000	$630,000	$110,000	$740,000

TABLE D-40

Summary of Total Estimated Costs by Site, Alternative 4+

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Segment ID	Source ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
	UG01-16	$783,000	$550,000	$1,330,000	$189,000	$1,520,000
	UG01-17	$2,680,000	$1,900,000	$4,550,000	$585,000	$5,140,000
	UG01-18	$663,000	$460,000	$1,130,000	$196,000	$1,320,000
	UG01-19	$205,000	$140,000	$349,000	$51,500	$401,000
	UG01-4	$11,600	$8,100	$19,700	$3,480	$23,200
	UG01-5	$459,000	$320,000	$780,000	$123,000	$903,000
	UG01-6	$2,430,000	$1,700,000	$4,140,000	$483,000	$4,620,000
	UG01-7	$511,000	$360,000	$868,000	$120,000	$988,000
	UG01-8	$277,000	$190,000	$471,000	$58,300	$529,000
	UG01-9	$529,000	$370,000	$900,000	$143,000	$1,040,000
	WAL013	$223,000	$160,000	$380,000	$20,200	$400,000
	WAL038	$55,200,000	$39,000,000	$94,400,000	$1,860,000	$96,300,000
	WAL068	$24,400	$17,000	$41,500	$3,180	$44,700
	WAL076	$1,120,000	$780,000	$1,900,000	$101,000	$2,000,000
	WAL077	$1,530,000	$1,100,000	$2,600,000	$104,000	$2,700,000

Notes:

This Table does not include CTP Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

NOTE: The above costs are presented rounded to three significant figures
NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

TABLE D-41

Summary of Total Estimated Costs by Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Watershed ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)
3+	BIG	$23,900,000	$16,700,000	$40,600,000	$6,320,000	$46,900,000
	CC	$40,000,000	$29,600,000	$69,600,000	$5,290,000	$74,900,000
	CCWP	$18,800,000	$13,300,000	$32,100,000	$1,990,000	$34,100,000
	MGS	$361,000,000	$253,000,000	$614,000,000	$25,500,000	$640,000,000
	MN	$2,490,000	$1,740,000	$4,220,000	$741,000	$4,970,000
	NM	$47,600,000	$33,300,000	$81,000,000	$11,800,000	$92,700,000
	PC	$26,000,000	$18,200,000	$44,100,000	$15,500,000	$59,600,000
	UG	$112,000,000	$80,200,000	$192,000,000	$19,100,000	$211,000,000
4+	BIG	$57,700,000	$40,400,000	$98,200,000	$11,400,000	$110,000,000
	CC	$72,100,000	$52,200,000	$124,000,000	$9,390,000	$134,000,000
	CCWP	$118,000,000	$82,700,000	$201,000,000	$13,000,000	$214,000,000
	MGS	$406,000,000	$285,000,000	$691,000,000	$32,300,000	$723,000,000
	MN	$2,800,000	$1,960,000	$4,750,000	$643,000	$5,400,000
	NM	$75,000,000	$52,500,000	$128,000,000	$16,600,000	$144,000,000
	PC	$30,800,000	$21,500,000	$52,300,000	$21,100,000	$73,400,000
	UG	$189,000,000	$135,000,000	$324,000,000	$32,000,000	$356,000,000

Notes:

This Table does not include CTP Sludge Pond Closure costs, these costs will be applied to the Total Alternative Cost.
This Table does not include Roads and Bridges costs, these costs will be applied to the Total Alternative Cost.

O&M = Operations and Maintenance
NPV = Net Present Value

BIG = Big Creek
CC = Canyon Creek
CCWP = Canyon Creek - Woodland Park
MGS = Mainstem, SFCDR
MN = Moon Creek
NM = Ninemile
PC = Pine Creek
UG = Upper South Fork

TABLE D-41

Summary of Total Estimated Costs by Watershed

Focused Feasibility Study, Upper Basin of the Coeur d'Alene River, Bunker Hill Superfund Site

Alternative	Watershed ID	2009 Total Direct Capital Cost	2009 Indirect Capital Cost	2009 Total Direct and Indirect Capital Cost	O&M Cost (30 Year NPV)	Total Cost (30 Year NPV)

NOTE: The above costs are presented rounded to three significant figures

NOTE: The above cost opinion is a Feasibility-Study-level estimate with a nominal accuracy of –30 percent to +50 percent (–30/+50%).

NOTE: The above cost opinion is in 2009 dollars and does not include future escalation. The order-of-magnitude cost opinion shown has been prepared for guidance in project evaluation from the information available at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, the final project scope, the final project schedule, and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

ATTACHMENT D-1

CTP Expansion for Treatment of Other OU 2 and OU 3 Waters

CTP Expansion for Treatment of Other OU 2 and OU 3 Waters

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PREPARED BY: Jim Stefanoff, P.E./CH2M HILL

DATE: January 14, 2010

1.0 Introduction

The purpose of this technical memorandum is to describe expansion of the Bunker Hill Central Treatment Plant (CTP), located in Kellogg, Idaho, for treatment of other Operable Unit 2 (OU 2) and OU 3 waters. The CTP primarily treats acid mine drainage (AMD) from the Bunker Hill mine along with relatively minor amounts of other OU 2 waters consisting of stormwater from the mine yard, drainage from the smelter closure area, vehicle decontamination water, and decontamination water associated with sampling.

The historical background of the CTP (Section 2.0) describes the 2001 Mine Water ROD Amendment (USEPA, 2001a), which selected a final remedy for managing Bunker Hill AMD, including improvements needed at the CTP. This is presented because improvements needed to expand CTP capacity for additional waters must consider interface with the CTP's role of treating its current inflows, and particularly Bunker Hill AMD (Section 3.0). Section 4.0 describes the estimated capital and O&M costs for a range of potential expanded CTP capacities.

This technical memorandum has been developed for the U.S. Environmental Protection Agency (USEPA) Region 10 under the requirements of CH2M HILL's USEPA Region 10 Architect and Engineering Service (AES) Contract 68-57-04-01.

2.0 Background

2.1 CTP Historical Background

Before 1928, liquid and solid waste from the Bunker Hill Mining and Metallurgical Complex was discharged directly into the South Fork of the Coeur d'Alene River (SFCDR) and its tributaries. In 1928 the waste was directed to a nearby floodplain where a Central Impoundment Area (CIA) was developed. AMD and wastewater from the complex were discharged to the CIA, where a pond was constructed to settle solids before discharging the liquids to the river. This primary treatment mechanism was one of the first major pollution control features instituted by the mining industry.

The CTP was constructed in 1974 by the Bunker Hill Mining Company to treat AMD from the mine and various sources of wastewater from their metallurgical complex. Bunker Hill mine AMD is the single strongest source of contaminated water in either OU 2 or OU 3,

having an average zinc concentration of about 170 milligrams per liter (mg/L), and a range of between about 60 and 700 mg/L. The average annual zinc load is about 3,000 pounds per day (lb/day).

The CTP uses the lime neutralization process to increase influent pH and to precipitate dissolved metals as oxy-hydroxide precipitates, which are settled in a clarifier and pumped into a sludge disposal pond located on the top of the adjacent CIA. Polymer is added prior to the clarifier to promote flocculation and settling of the precipitates. The CTP does not have filters to remove precipitates that do not settle in the clarifier.

In 1974, when the CTP was first brought online, AMD and complex waters were stored in an unlined pond on top of the CIA before being decanted to the CTP. When the smelter closed in 1981, the CIA was no longer required to impound wastewater from the complex, although surface runoff from the complex and AMD from the mine were still routed to the CIA before treatment. Sludge formed during the treatment process was also disposed of in unlined ponds on top of the CIA.

Ownership of the mine has passed through a number of companies during the more than 100-year history of the site, finally ending up under the direction of the New Bunker Hill Mining Company (NBHMC). NBHMC did not, however, purchase the CTP. Bunker Limited Partnership (BLP), and then the Gulf and Pintlar corporations as creditors of BLP, continued to operate the treatment plant using money from a trust fund established as part of the BLP bankruptcy. The federal and state governments assumed operation of the CTP in November 1994, following the bankruptcy of the Gulf and Pintlar corporations. In that same year, USEPA issued a Unilateral Administrative Order to NBHMC directing the company to keep the mine pool pumped to an elevation below the level of the SFCDR to prevent discharges to the river, to convey mine water to the CTP for treatment unless an alternative form of treatment was approved, and to provide for emergency mine water storage within the mine. The CTP was operated by the BLP, under the direction of USEPA, from November 1994 to February 1996 using money from the BLP trust fund. At that time, it was determined that the BLP trust fund monies would be better spent on ongoing site cleanup.

Since February 1996, the ongoing treatment of AMD has been conducted and funded by the federal and state governments. The U.S. Army Corps of Engineers currently operates the CTP for USEPA using a contractor. The CTP includes all associated mine water infrastructure components external to the mine (the AMD collection ditch at the Kellogg Tunnel portal [the main entrance to the mine], the AMD conveyance pipelines to the CTP, and the lined pond [a 7 million-gallon lined AMD storage pond]), the CTP, and the sludge disposal pond located on the CIA used for treatment residuals. The NBHMC is currently operating the Bunker Hill mine and maintaining its infrastructure, including the AMD collection ditches within the mine, the mine pool pumping system used to pump the lower workings water to the 9 Level (the main operations level which drains AMD out through the Kellogg Tunnel ditch system), and the Kellogg Tunnel itself.

2.2 Record of Decision Amendment

An amendment to the OU 2 1992 Non-Populated Areas Record of Decision (ROD), which addressed management of AMD from the mine, was issued in December 2001 (USEPA, 2001a). The ROD Amendment was necessary to address shortcomings presented by the

existing mine water control systems that resulted in continued generation and discharge of AMD from the mine and the antiquated state of the CTP. The ROD Amendment identified decreasing water entry to the underground workings as the most viable way to reduce the magnitude of the AMD problem. The selected remedy for managing AMD from the Bunker Hill mine was Alternative 3 - Phased Source Control/Treatment. Each component of the remedy and its current status is described below.

AMD Mitigation

This component of the remedy includes actions to reduce the quantity of surface water entering the mine and AMD created within the mine. This would provide the following benefits:

- Reduced in-mine maintenance associated with drifts and drainage ditches
- Reduced mine water pumping from the lower workings
- Improved reliability of conveying mine water to the portal for collection
- Reduced peak treatment flows at the CTP
- Generation of less sludge
- Reduced CTP operations costs

The mitigations include constructing a stream diversion on the West Fork of Milo Creek, modification of the Phil Sheridan raise system, and plugging in-mine drill holes, as a first phase of source control. These efforts are expected to have the greatest impact on reducing the magnitude of mine water flows and the strength of the flows (in terms of the amount of dissolved metal contaminants) exiting the mine through the Kellogg Tunnel. Other flow reduction measures would be considered in future phases, based on performance monitoring and an evaluation of the ability of additional measures to provide cost-effective water and/or contaminant reductions.

AMD Collection

This component includes collection of AMD within the mine. The ROD Amendment specified use of the existing AMD collection system within the mine and transport through the Kellogg Tunnel using the existing ditch system—given that the mine, at the time of the ROD Amendment and also currently, is an open and operational mine.

AMD Storage

AMD storage is required during those times when the treatment plant is shut down for maintenance or repairs, or when the mine water flow exceeds treatment capacity. Mine water flows in excess of 2,500 gallons per minute (gpm) would be temporarily stored in the existing lined pond or in the mine using a new gravity system to divert water into the mine pool. A new mine pool extraction system would be installed to reduce the time needed to extract the stored water and to increase reliability.

AMD Conveyance

This component of the remedy includes the conveyance of mine water from the Kellogg Tunnel to the CTP. A new section of pipe would be added to allow direct flow of AMD to the CTP rather than to the lined pond, where it requires pumping because its elevation is lower than that of the CTP.

AMD Treatment

The CTP would be upgraded to improve efficiency and increase reliability, to make less sludge, and to achieve lower concentrations of metals in the plant's discharge allowing compliance with the State of Idaho's water quality criteria. The existing CTP cannot consistently meet the criteria because of the lack of media (sand) filters, and operates under an expired National Pollutant Discharge Elimination System (NPDES) permit. Under the ROD Amendment remedy, the CTP was to have an initial treatment capacity using media filters of 2,500 gpm, but an overall treatment capacity of 5,000 gpm. Flows in excess of 2,500 gpm would either be bypassed around the filters or passed through the filters at higher than design-flow rates. Additional filtration capacity could be added if determined to be necessary based on the performance of the AMD mitigations for reducing peak AMD flows.

Sludge Management

USEPA selected sludge disposal Option A (disposal of sludge in beds on top of the CIA). However, because of community concerns about competing disposal needs, preserving developable site land, and potentially developing regional disposal areas as part of the Coeur d'Alene River Basin cleanup efforts, sludge disposal was to be implemented in the following manner:

1. Execute initial upgrades to the CTP. These upgrades will reduce the current amount of sludge produced by about half, thereby doubling the expected life of the current disposal area.
2. Reevaluate whether additional regional sludge disposal capacity has become available as part of the Basin (OU 3) cleanup efforts, which would make offsite disposal more cost-effective. If so, pursue offsite sludge disposal. If not, construct one 10-year disposal bed on the CIA, and close the existing sludge disposal area using a capping system similar to the rest of the CIA.
3. Reconsider Step 2 before the construction of additional sludge beds on the CIA.

Performance Monitoring

Monitoring of the remedy was to include an assessment of untreated mine water within the mine and at the Kellogg Tunnel portal, the quality of water treated at the CTP and measured where effluent is discharged into Bunker Creek, and the performance of source control actions (mitigations) to determine if additional flow reduction measures or treatment capacity are warranted.

2.3 Status of Mine Water Remedy

A number of actions associated with the mine water remedy have been completed since the signing of the ROD Amendment. The completed actions are discussed below by remedy component, as presented in the ROD Amendment. In addition, this section identifies the remedy actions that have yet to be implemented. This information is provided because upgrades to the CTP for treatment of other OU 2 and OU 3 waters need to consider how to integrate required changes with the existing mine water-related treatment infrastructure.

AMD Mitigations/Source Control

The original mitigation actions to be constructed as part of the remedy include diverting West Fork Milo Creek around the Guy Cave area (an area of known infiltration to the worst AMD-forming areas of the mine), modifying the Phil Sheridan Diversion, and plugging various in-mine drill holes that produce water. None of these actions has been constructed. A 95 percent complete design was developed for the West Fork Milo Creek Diversion, which includes modifying the Phil Sheridan Diversion.

AMD Collection

The AMD collection approach presented in the ROD Amendment consisted of gathering the AMD within the mine using the existing collection system. Under the existing system, mine water from the upper portions of the mine flows by gravity to the 9 Level and out the Kellogg Tunnel. A portion of the flow from the upper mine bypasses the 9 Level and discharges to the submerged workings (the mine pool), along with an unknown amount of water coming from the cross-connected Crescent Mine. The mine pool water is pumped from near the 11 Level up to the 9 Level through Shaft No. 2, where it joins the gravity drainage water in the 9 Level ditch system and flows out the Kellogg Tunnel. The current collection system requires that a large portion of the mine infrastructure, including the Kellogg Tunnel, a large portion of 9 Level, Raise No. 2 and the hoist, and the Cherry Raise and hoist, be maintained to allow for maintenance and periodic cleaning. However, these areas must also be maintained this way to support the ongoing mine operations.

This remedy used the existing AMD collection procedure, which is still in use today. Thus, no new AMD collection actions were included in the remedy as the mine was, and still is, open and operational.

AMD Conveyance

This remedy included construction of a new pipeline to allow AMD to drain directly to the CTP rather than to the lined pond, where it was resulting in an accumulation of sediment, and the need to continuously pump the AMD to the CTP because of the pond's lower elevation. This new section of pipeline is known as the Direct Feed pipeline.

The Direct Feed pipeline was installed in 2002. The pipeline is constructed of 20-inch high-density polyethylene (HDPE) and includes valves to allow AMD to flow to either the lined pond or directly to the CTP. A cleaning vault was constructed to allow periodic inspection of the pipeline and cleaning by "pigging."

AMD Storage

Current mine water storage options consist of storing mine water either in the lined pond or the lower portions of the mine itself. The remedy did not change this storage approach but included construction of a new gravity diversion system to increase the flexibility of storing water in the mine pool. The new gravity diversion would route water from the upper workings of the mine into the mine pool for temporary storage when the lined pond did not provide sufficient storage capacity. An evaluation conducted during the Remedial Instruction/Feasibility Study (RI/FS) (USEPA, 2001b) indicated that the water in the mine pool could rise up to the 10 Level with no net gravity head of mine pool water towards the SFCDR. This remedy also included a new mine pool extraction system to reduce the time

needed to extract the stored water. The conceptual design of the new extraction system consisted of two 700 gpm pumps installed below 11 Level and an upgrade of the current mine electrical system to support the pumping operation. The remedy also included continued repair and maintenance of the existing lined pond.

An alternate and simpler approach to the remedy gravity diversion system was proposed and implemented by the mine owner. This system consists of temporarily constructing a sandbag cutoff dam at the back of the Kellogg Tunnel to impound AMD and to back up the AMD into the Barney Vent Raise, where it flows down to 10 Level and subsequently into the mine pool. This system was funded by the mine owner; therefore, no USEPA or state funding was required.

Although not specified in the remedy, the lined pond was cleaned of accumulated sediment in 2003 to improve storage capacity. This was done after the construction of the Direct Feed pipeline.

AMD Treatment

As described previously, the CTP was built in 1974 and had not been updated in any significant way at the time the ROD Amendment was adopted. Much of the equipment was nearly worn out, and many of the automated control systems no longer functioned or had been removed. The plant's sand filters, previously used to remove solids from the discharge, had also been removed. Their removal resulted in the plant being unable to function in high-density sludge (HDS) mode (a mode of lime treatment whereby significantly less sludge is produced) as it had originally; the plant also was unable to consistently meet the discharge standards of its expired NPDES permit. The plant had no backup power and went offline periodically because of electrical interference from lightning storms or localized power surges. All original alarm systems were inoperative. A Radio Shack™ phone auto-dial box was the only alarm system and it was unreliable due in part to leaks in the electrical room roof. Buildup of solids in plant pipes had reduced its capacity from 5,000 gpm to about 3,500 gpm. The lime storage silo was caked with hardened lime, and the lime makeup and feed system was manual requiring significant operator attention. The wall upon which the electrical equipment was mounted leaked, and constant seepage had rusted out the back of many of the electrical panels. In summary, the plant was far below modern operational standards, was prone to failure, and was labor intensive to operate. The CTP Master Plan (Bunker Hill RI/FS, Appendix E) specified needed improvements to address these problems. These improvements were adopted as part of the ROD Amendment.

As mentioned above, the CTP was originally designed to use lime HDS treatment technology. This process uses lime to remove acidity and to precipitate the dissolved metals as hydroxides, which creates solids known as "sludge." The HDS process creates sludge of much higher density than conventional lime treatment. HDS sludge dewaters to a greater extent and requires much less disposal space than conventional lime sludge, thereby significantly reducing cost.

At the time of its construction in 1974, only a few HDS plants were on-line in the world. This technology is still state-of-the-art and used at hundreds of mine and industrial sites. However, while originally designed as an HDS plant, the CTP currently must be operated in a "low-density sludge" mode, which prevents the formation of true HDS. This is because

the sand filters, needed for polishing excess suspended solids from the clarifier overflow, have been removed. Filters are also needed to allow the CTP to not only consistently meet its current discharge standards established by the expired NPDES permit, but also the much more rigorous standards yet to be enacted pursuant to Idaho water quality standards. This is primarily because excess solids periodically overflow into the plant effluent, increasing the concentration of zinc beyond discharge standards. New discharge standards, in conformance with current Idaho water quality standards, were established for the CTP as part of the ROD Amendment. These new standards will be adopted once filters are constructed. Filter construction would also allow the plant to be operated in HDS mode, significantly reducing long-term sludge disposal costs.

Since the ROD Amendment, USEPA and the State of Idaho have moved forward with a number of CTP improvements specified in the CTP Master Plan. The following improvements were performed as part of time critical actions taken to replace the most failure-prone equipment and plant systems:

- Replaced and upgraded the lime storage and feeding system
- Refurbished the thickener
- Updated the plant electrical system
- Constructed a new control building and updated the plant control system including new alarm systems
- Increased the hydraulic capacity to 5,000 gpm by replacing the pipeline between the thickener and the polishing pond
- Installed a backup diesel electrical generator and sound-deadening enclosure
- Installed a new sludge recycle pump and disposal pipeline from the CTP to the sludge disposal cell

The following actions remain to be implemented. Addition of the filters would allow the plant to meet Idaho water quality standards and to operate in the HDS mode, thus significantly reducing sludge disposal volumes. The other items listed below are needed to complete plant modernization.

- Add 2,500 gpm of filters and associated piping and pump stations, and a new building to house the filters
- Replace Reactor A (sludge conditioning tank/rapid mix tank) and agitator
- Replace the Aeration Basin with a new Reactor B, agitator, and air blower
- Replace the manual polymer makeup system with an automated system, and replace the feed pumps and pipes
- Replace the other sludge recycle and wasting pumps
- Add an influent flow meter and replace the effluent Parshall flume

Sludge Management

A new sludge pipeline from the CTP to the existing CIA sludge bed was installed. This was needed because the old pipeline was periodically developing leaks and was in poor

condition. The existing CIA sludge bed is still being used and estimated to have about 12 years of remaining life.

Performance Monitoring

A major aspect of the remedy was the phased approach to implement AMD source control measures (mitigations). Information collected from the monitoring program would be used to help determine if additional mitigations were required beyond those included in the first phase. The remedy includes performance monitoring of:

1. AMD at various locations within the mine (for a 10-year period as part of the phased implementation approach for source control measures/CTP capacity) and at the at the Kellogg Tunnel portal
2. Treated CTP effluent at its discharge
3. Source control actions to determine if additional flow reduction measures or treatment capacity are warranted (for a 10-year period as part of the phased implementation approach for source control measures/CTP capacity)

Treated CTP effluent is monitored at the outfall to Bunker Creek. Periodic samples of the AMD from the Kellogg Tunnel portal are also collected along with flow rate. No in-mine AMD monitoring has been conducted, nor has monitoring associated with source control action areas such as Milo Creek and its tributaries.

3.0 CTP Treatment Capacity Expansion

The CTP could be effectively expanded to treat other metals impacted water from OU 2 or OU 3, such as groundwater or AMD from other mines. The 2005 Canyon Creek treatability study (CH2M HILL, 2006) demonstrated that Canyon Creek groundwater could be successfully co-treated with Bunker Hill mine AMD using the lime HDS treatment process, which is the same process used at the CTP—although the CTP is currently operated in a low-density sludge mode because of lack of media filters as described earlier.

The 2005 Canyon Creek treatability study also demonstrated that the lime HDS process can successfully treat much more dilute streams than the combination of Bunker Hill mine water and Canyon Creek groundwater. A separate test was conducted on just Canyon Creek groundwater. While the effluent quality was as good, the sludge was not as dense as the combined Bunker Hill mine and Canyon Creek groundwater, although it was much denser than what would be produced from traditional lime treatment not employing the HDS approach.

3.1 CTP Capacity

The CTP could be expanded to treat very large inflows. Equipment could be upsized and/or replicated as needed. Constraints on ultimate capacity are primarily limited to availability of land and related infrastructure. The largest single piece of equipment needed is the clarifier. While additional clarifiers could be added, the existing 236-foot-diameter unit has a maximum hydraulic capacity, based on the results of the Canyon Creek treatability testing program, of about 30,000 gpm. Higher flows than this may be effectively treated, but given

available information, this flow is a reasonable upper end limit without addition of a second clarifier.

3.2 Modifications Needed

The following CTP modifications would be needed to treat up to 30,000 gpm and to meet Idaho water quality standards. Below are the required modifications, which are already planned as part of the remaining ROD Amendment upgrades:

- Add 2,500 gpm of media filters, associated piping and pump stations, and a new building to house the filters
- Replace Reactor A (sludge conditioning tank/rapid mix tank) and agitator
- Replace the manual polymer makeup system with an automated system, and replace the feed pumps and pipes
- Replace the existing nearly worn-out sludge recycle and wasting pumps
- Add electrical, instrumentation, and controls associated with the new equipment

The follow modifications are required to treat additional OU 2 and OU 3 waters that are not part of the remaining ROD amendment upgrades:

- Add additional media filters, associated piping and pump stations, and a new building to house the filters if needed
- Replace the Aeration Basin with two new Reactor B tanks, each with an agitator, air blower, and associated inlet and outlet piping
- Increase the hydraulic capacity of the clarifier feed trough, clarifier effluent launder, and perhaps the feedwell
- Add a larger influent flow meter and a larger effluent Parshall flume
- Add electrical, instrumentation, and controls associated with the new equipment
- Install an additional backup diesel generator if needed (the existing one may have sufficient capacity depending on plant configuration and operation)

3.3 Implementation

Increasing the CTP capacity up to 30,000 gpm is implementable. The lime HDS process is a proven treatment technology, whose effectiveness was demonstrated during the Canyon Creek treatability study. The necessary equipment, materials, and labor force to construct the required changes are available. The additional treatment chemicals (lime and polymer) are available from existing suppliers. The additional power requirements are available from the local utility (Avista). The Canyon Creek treatability study demonstrated that Idaho water quality standards could be met.

CTP expansion would likely be conducted in phases to accommodate when additional influent sources would be available. This approach is similar to the two-phased approach described in Appendix E of the mine water RI/FS document (USEPA, 2001b). One approach would be to use two phases, whereby one-half of the maximum needed capacity would be

constructed in Phase 1 and the second half in Phase 2. This would allow capacity to better accommodate the timing of influent demand.

4.0 Capital and O&M Costs

An order-of-magnitude cost opinion was developed to increase the CTP to various maximum capacities. This one done using the capital and O&M cost estimates developed for the mine water RI/FS and updated in 2006, and then modifying them for maximum capacities of either 5,000; 10,000; 15,000; or 20,000 gpm. These costs were escalated to 2009 dollars and used to develop a capital cost curve and an O&M cost curve relating cost to capacity. The cost estimates and curves are attached to the back of this technical memorandum.

The curves are quite linear with respect to capacity, as was expected, because the size of the required upgrades, and particularly the filters, is proportional to flow. The capital costs represent the total cost to upgrade the existing plant to the desired capacity. The annual O&M costs include treatment of the Bunker Hill mine water, and O&M associated with all existing mine water systems consisting of the Kellogg Tunnel portal collection system, the AMD pipelines, the lined pond, and the CIA sludge disposal bed.

The largest single capital cost component is associated with adding the media filters. Media filters are sized based on flow (gpm) per media filter surface area (square feet). Thus, increasing the treatment capacity from 2,500 gpm to 20,000 gpm requires 8 times the area of filters. The next largest capital cost is associated with constructing the neutralization/ aeration reactors. These are sized using treatment residence time, which is also proportional to flow.

While the capital cost required to construct 20,000 gpm of capacity is about 5 times that required to provide 2,500 gpm capacity, the annual O&M cost increases by only about 0.5 times, or about 50 percent. This is because once the plant treatment capacity is available, the incremental cost, on a per-gallon basis, to treat additional water is relatively low. Little additional operations labor is required, and the increased lime and polymer consumption is also relatively low because of the much more dilute nature of the other OU 2/OU 3 waters as compared to Bunker Hill mine water.

The attached cost opinions are considered order-of-magnitude, with an expected accuracy of minus 30 percent to plus 50 percent. Estimated capital and operating costs were derived from vendor quotes, cost estimating manuals, historical operating budgets, and similar projects. Costs are for comparative purposes only. Net present value (NPV) costs are based on 30 years of operation at a 7 percent interest rate. The order-of-magnitude cost opinions are in 2009 dollars. They have been prepared for guidance in project evaluation and should be carefully reviewed before making specific financial decisions or establishing final project budgets. The actual costs are expected to vary from the costs shown here based on actual labor and material costs, competitive market conditions, final project scope, and other variable factors.

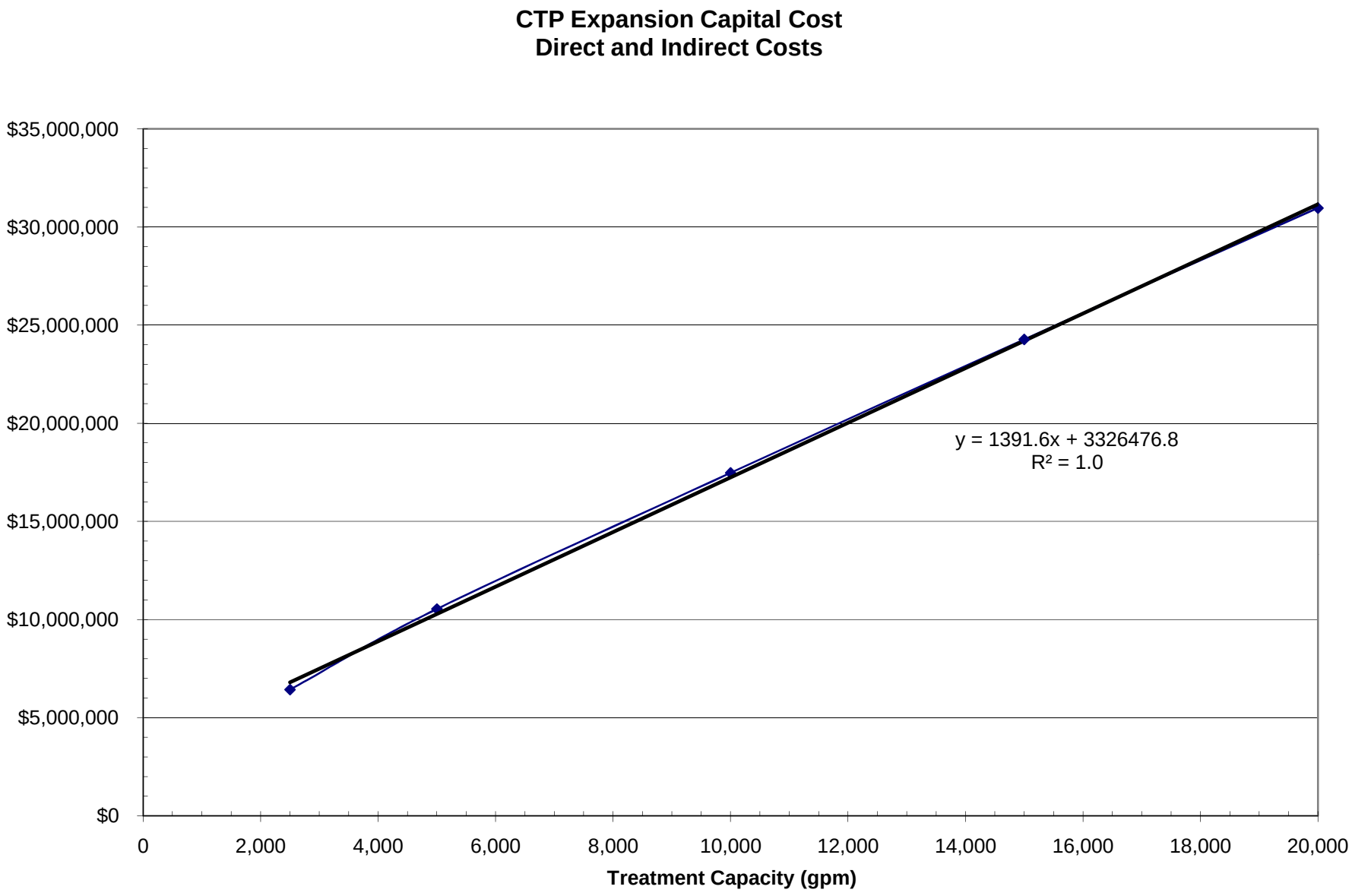
5.0 References

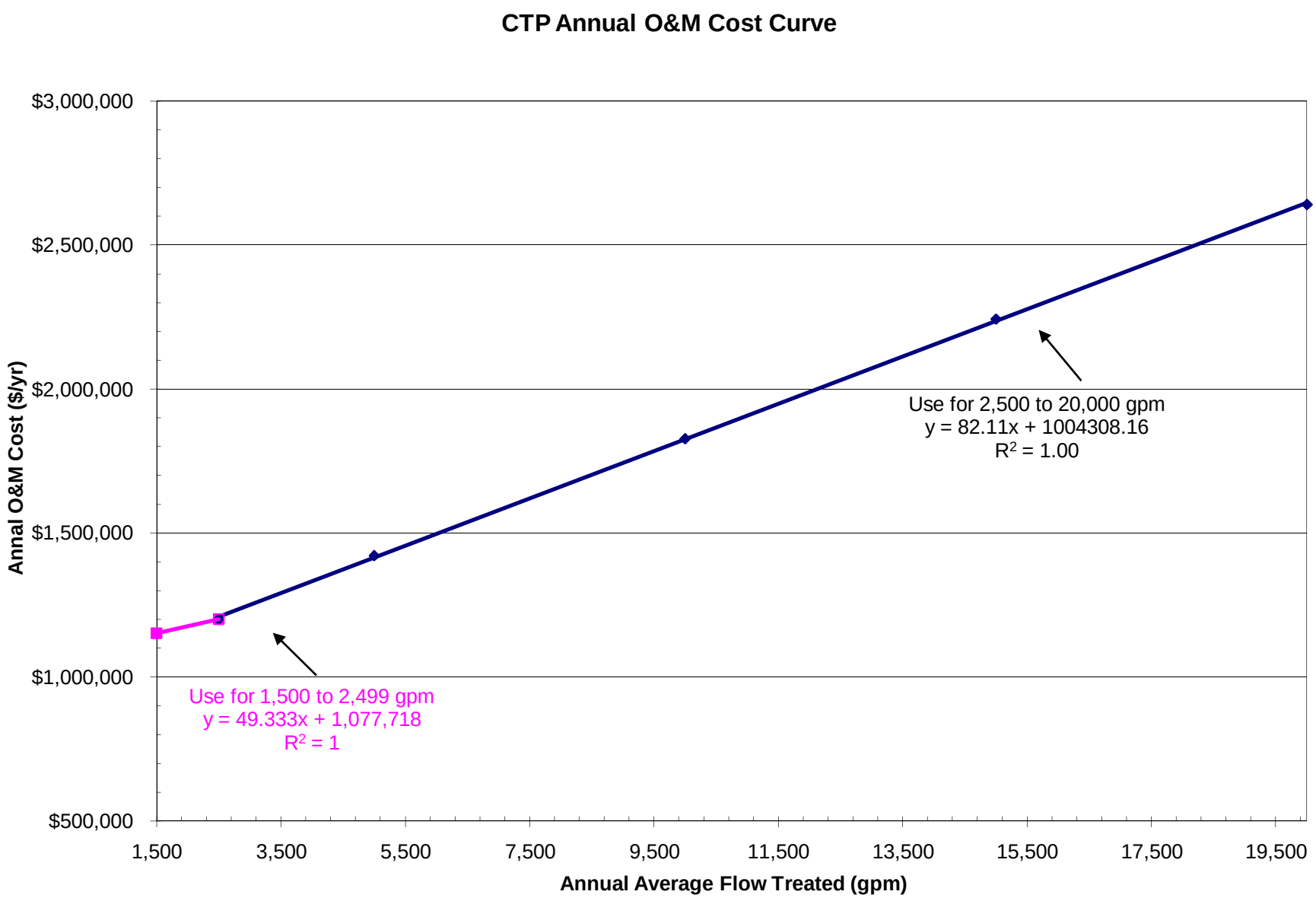
CH2M HILL. 2006. *Canyon Creek Phase II Treatability Study*. Prepared for the United States Environmental Protection Agency. October 2006.

U.S. Environmental Protection Agency (USEPA). 2001a. *Record of Decision Amendment, Non-Populated Areas Operable Unit, Bunker Hill Mining and Metallurgical Complex, Shoshone County, Idaho*. December 2001

U.S. Environmental Protection Agency (USEPA). 2001b. *Bunker Hill Remedial Investigation/Feasibility Study*. April 2001.

Figures and Tables


CTP Expansion Capital Cost
Direct and Indirect Costs
$35,000,000
$30,000,000
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
Treatment Capacity (gpm)
y = 1391.6x + 3326476.8
R² = 1.0


CTP Annual O&M Cost Curve
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
Annual O&M Cost ($/yr)
1,500
3,500
5,500
7,500
9,500
11,500
13,500
15,500
17,500
19,500
Annual Average Flow Treated (gpm)
Use for 2,500 to 20,000 gpm
y = 82.11x + 1004308.16
R2 = 1.00
Use for 1,500 to 2,499 gpm
y = 49.333x + 1,077,718
R2 = 1

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 2,500 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$25,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	170	LF	$32,926	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tank	450	SF	$11,250	45'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$6,814	
Earthwork & Concrete for Slab	1	LS	$65,578	apx 165cy @ $400/cy
Paint	1	LS	$50,000	allowance for subcontract
Aeration Tank (Reactor B), 75,000gal Steel Tank	1	EA	$56,250	revised to $.75/gal
Submerged Turbine Aerator/Mixer	1	EA	$73,520	use same a 5000gpm estimate
Positive Displacement Blower	1	EA	$13,205	
Pipe Supports, Hangers, etc	1	LS	$2,500	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 2,500 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	0	LS	$0	quote + frt & markup=$19/lf & allow for removal & replacement
Groundwater Test & Empty Tank	0	LS	$0	allowance
Replace Thickener Rake System Complete	0	LS	$0	quote + frt & markup
E-DUC Feed & Floc System & Center Well Mods	1	LS	$45,934	quote + frt & markup + add'l parts for mods
Surface Prep & Coat	0	LS	$0	allowance for interior walls & mechanism
Sludge Wasting & Recycle Pumps				
Earthwork & Concrete for Slab	0	LS	$0	apx 200cy @ $400/cy
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	allowance for subcontract
Sludge Recycle Pump, 400gpm	2	EA	$29,234	new cost for smaller pump
Sludge Recycle Pump, 800gpm	1	EA	$22,048	new cost for smaller pump
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	new cost for larger pump
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$41,371	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$3,037	12"
Electrical	1	LS	$70,568	use 8% of above
Existing Plant Demolition				
Earthwork	1	LS	$7,314	
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Sanitary	1	LS	$1,917	toilet, piping & service
Drains	1	LS	$2,117	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 2,500 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HVAC	1	LS	$1,617	reinstall unit heaters
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
HDS Pump Station Complete	1	LS	$70,000	cost by DAH
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	1	LS	$566,834	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required per JS 11/28/2000
Backwash Pumping Complete	1	LS	$133,461	Bob York spreadsheet + 10% OH&P, scaled to 2500gpm + escalation to 2(
Dirty Backwash Storage Tank, 30,000gal	1	EA	$22,500	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$3,737	allowance
Dirty Backwash Return Pump	1	EA	$13,885	allowance
Clean Backwash Supply Tank, 30,000gal	1	EA	$22,500	$.75/gal
Clean Backwash Supply Pump	1	EA	$13,885	
Building Complete	1	LS	$318,750	85'x 50 @ $75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	1,000	LF	$23,000	2" plastic
Paint	1	LS	$5,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$4,736,050**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$6,432,827**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$30,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	85	LF	$16,463	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	225	SF	$5,625	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$95,337	apx 450cy @ $400/cy
Paint	2	LS	$100,000	allowance for subcontract
Aeration Tank (Reactor B), (2) 75000 gal Steel Tank	2	EA	$112,500	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$130,583	
Positive Displacement Blower	2	EA	$23,031	
Pipe Supports, Hangers, etc	1	LS	$5,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Polymer Feed Tank, 2000gal	1	EA	$3,974	
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$28,905	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$32,334	
Sludge Wasting & Recycle Pumps				
Earthwork & Concrete for Slab	0	LS	$0	apx 200cy @ $400/cy
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$51,892	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$88,444	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance
Earthwork	1	LS	$7,314	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$106,100	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	2	LS	$1,133,668	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$190,677	
Dirty Backwash Storage Tank	1	EA	$45,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$5,182	allowance
Dirty Backwash Return Pump	1	EA	$20,080	allowance
Clean Backwash Supply Tank	1	EA	$45,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$20,080	
Building Complete	1	LS	$637,500	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	2,000	LF	$46,000	2" plastic
Paint	1	LS	$10,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$7,760,880**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$10,541,358**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final schedule and other variable factors. As a result, the final project costs will vary from those

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 5,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.				

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 10,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$35,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	170	LF	$32,926	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	450	SF	$11,250	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$123,174	apx 450cy @ $400/cy
Paint	2	LS	$151,572	allowance for subcontract
Aeration Tank (Reactor B), 150,000 gal Steel Tank	2	EA	$225,000	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$197,926	
Positive Displacement Blower	2	EA	$32,010	
Pipe Supports, Hangers, etc	1	LS	$10,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 10,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$43,010	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$45,934	
Sludge Wasting & Recycle Pumps				
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$68,294	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$115,998	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance
Earthwork	1	LS	$7,314	
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 10,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$160,818	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	4	LS	$2,267,336	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$289,013	
Dirty Backwash Storage Tank	1	EA	$90,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$7,371	allowance
Dirty Backwash Return Pump	1	EA	$29,470	allowance
Clean Backwash Supply Tank	1	EA	$90,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$29,470	
Building Complete	1	LS	$1,275,000	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	4,000	LF	$92,000	2" plastic
Paint	1	LS	$20,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$12,862,956**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$17,471,346**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation. The order of magnitude cost opinion shown has been prepared for guidance in project evaluation at the time of preparation. The final costs of the project will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$40,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	261	LF	$50,487	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	690	SF	$17,250	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$151,011	apx 450cy @ $400/cy
Paint	2	LS	$195,884	allowance for subcontract
Aeration Tank (Reactor B), 230,000 gal Steel Tank	2	EA	$345,000	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$255,791	
Positive Displacement Blower	2	EA	$39,726	
Pipe Supports, Hangers, etc	1	LS	$15,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$57,115	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$59,534	
Surface Prep & Coat	0	LS	$0	allowance for interior walls & mechanism
Sludge Wasting & Recycle Pumps				
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$84,243	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$142,793	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Earthwork	1	LS	$7,314	
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$205,111	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	6	LS	$3,401,004	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$368,614	
Dirty Backwash Storage Tank	1	EA	$135,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$9,143	allowance
Dirty Backwash Return Pump	1	EA	$37,070	allowance
Clean Backwash Supply Tank	1	EA	$135,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$37,070	
Building Complete	1	LS	$1,912,500	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	6,000	LF	$138,000	2" plastic
Paint	1	LS	$30,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$17,875,000**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$24,279,000**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation.
The order of magnitude cost opinion shown has been prepared for guidance in project evaluation
at the time of preparation. The final costs of the project will depend on actual labor and material

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 15,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
costs, actual site conditions, productivity, competitive market conditions, final project scope, final schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.				

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
HDS (Hydroxide)				**The Following Costs are in Year 2000 Dollars. See Escalation Factor at Bottom.**
Sitework/Yard Piping				
Fencing	1,000	LF	$10,000	allowance
Gravel Surfacing & Misc	1	LS	$45,000	allowance
Connections & Relocations of Existing Piping	1	LS	$30,000	allowance
Reactor A (Sludge Conditioning Tank)				
Earthwork & Concrete for Slab	1	LS	$19,872	apx 50cy @ $400/cy
Elevated Platform for Reactor A&B	1	LS	$60,000	asm 40x20 @ $75/sf high level and to support reactor A
Paint	1	LS	$10,000	allowance for subcontract
Sludge Conditioning Tank, 2500gal FRP	1	EA	$42,695	quote + 5% infla. + 5%frt + 10%mu
Mixer, 3hp	1	EA	$13,803	quote + 5% infla. + 5%frt + 10%mu
Inlet Piping, 24" SDR 15.5	120	LF	$23,242	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Inlet Piping, 18" SDR 15.5	120	LF	$17,634	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Valves, vaults, etc	1	LS	$50,000	allowance
Neutralization/Oxidation System				
Distribution Piping, 24" HDPE	340	LF	$65,853	constrained schedule & access w/obstacles, ftgs, valves, connections, etc
Retaining Wall to Accommodate New Tanks	900	SF	$22,500	90'x 8'H + 2' below grade, CIP cantelever
Earthwork for Retaining Wall	1	LS	$13,629	
Earthwork & Concrete for Slab	1	LS	$178,848	apx 450cy @ $400/cy
Paint	2	LS	$229,740	allowance for subcontract
Aeration Tank (Reactor B), 300,000gal Steel Tank	2	EA	$450,000	$0.75/gal
Submerged Turbine Aerator/Mixer	2	EA	$300,000	
Positive Displacement Blower	2	EA	$45,620	
Pipe Supports, Hangers, etc	1	LS	$20,000	allowance
Automated Polymer Make-up & Feed System				
Earthwork & Concrete for Slab	1	LS	$0	in bldg
Paint	1	LS	$5,000	allowance for subcontract
Polymer Make-up System	2	EA	$20,433	
Polymer Make-up Tank, 2000gal	1	EA	$3,974	
Mixer	2	EA	$4,674	corrected hours

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Transfer Pump, 20gpm	2	EA	$6,548	corrected hours
Polymer Feed Tank, 2000gal	1	EA	$3,974	
Variable Speed Gear Pump, 1gpm	2	EA	$8,421	
Piping to Feed Point	100	LF	$1,990	
Thickener				
Clean & Decommission Existing Floc System	1	LS	$1,775	
Replace Weir	1	LS	$71,040	
E-DUC Feed & Floc System & Hydraulic Mods	1	LS	$73,134	
Sludge Wasting & Recycle Pumps				
Remove Existing Pumps	1	LS	$2,474	
Paint	1	LS	$20,000	
Sludge Recycle Pump, 400gpm	2	EA	$29,234	
Sludge Recycle Pump, 800gpm	1	EA	$22,048	
Sludge Waste Pump, 400gpm, 200' tdh	1	EA	$26,380	
Sludge Recycle Piping, 8" DI	150	LF	$10,271	including ftgs, valves, etc, revised cost
Sludge Wasting Piping, 6" DI	0	LF	$0	including ftgs, valves, etc, revised cost
I&C and Electrical				
Total I&C	1	LS	$97,990	use 5% of above
New Magnetic Flowmeter in Existing Vault	1	EA	$10,269	24"
Parshall Flume @ Effluent	1	EA	$5,537	
Electrical	1	LS	$165,888	use 8% of above
Existing Plant Demolition				
Remove Reactor A	1	LS	$2,810	
Remove Aeration Basin, Ret Wall, Stairs, etc	1	LS	$127,768	6000cy @ 200cy/hr
Remove Flocculation Basin	1	LS	$18,734	allow 40hrs
Remove Associated Piping	1	LS	$1,873	
Remove Associated Electrical	1	LS	$1,873	
Regrade Area	1	LS	$1,704	
Connections & Relocations of Existing Piping	1	LS	$5,000	allowance
Earthwork	1	LS	$7,314	

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
Concrete Slab & Footings	100	CY	$25,536	assume 18" avg thickness to account for ftgs, etc
Relocate Existing Filtration Bldg, etc	1	LS	$34,071	60' x 30' x 10' eave ht metal bldg-remove contents, dismantle & re-erect
Repairs, Touchup, etc	1	LS	$5,000	allowance for some painting, sealants, doors, etc
Water	1	LS	$4,235	sink, emer. Shower, hose bibbs, piping & service
Drains	1	LS	$2,117	
Electrical	1	LS	$4,933	reinstall, fixtures, panels, wiring, etc
Tertiary Media Filters				
Filter Pump Station Complete	1	LS	$243,600	
Water Reuse Pump Station Complete	1	LS	$30,000	cost by DAH
Distribution Piping	500	LF	$17,500	4" plastic, below grade
Media Filter System	8	LS	$4,534,673	quote=430000 + 10% frt + 10% mu & 100hrs to install
Liquid Polymer System	0	LS	$0	Not required as per JS 11/28/2000
Backwash Pumping Complete	1	LS	$464,445	
Dirty Backwash Storage Tank	1	EA	$180,000	$.75/gal
Dirty Backwash Storage Tank Mixer	1	EA	$10,683	allowance
Dirty Backwash Return Pump	1	EA	$43,675	allowance
Clean Backwash Supply Tank	1	EA	$180,000	$.75/gal
Clean Backwash Supply Pump	1	EA	$43,675	
Building Complete	1	LS	$2,550,000	$75/sf
Electrical/I&C	1	LS	$0	included
Mechanical	1	LS	$0	included
Backflow Preventer	1	EA	$10,000	allowance
Distribution Piping	8,000	LF	$184,000	2" plastic
Paint	1	LS	$40,000	misc painting allowance
CAPITAL TOTAL (ROUNDED) (Yr 2000 Dollars)			**$22,800,505**	**Year 2000 Dollars**
Escalate from Yr 2000 to Yr 2009 Dollars (factor of 1.358)			**$30,969,204**	**Year 2009 Dollars**

NOTE: The above cost opinion is in October 2000 dollars and does not include escalation.
The order of magnitude cost opinion shown has been prepared for guidance in project evalu
at the time of preparation. The final costs of the project will depend on actual labor and mate
costs, actual site conditions, productivity, competitive market conditions, final project scope, f

Bunker Hill CTP
Bunker Hill Mine Water
Upgrade Existing CTP to Treat 20,000 gpm

Order of Magnitude Cost Opinion

Description	Quantity	Unit	Direct Capital Unit Cost	Comments
schedule and other variable factors. As a result, the final project costs will vary from those presented above. Because of these factors, funding needs must be carefully reviewed prior making specific financial decisions or establishing final budgets.				