Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling: Results from Selected Mine and Mill Sites

PREPARED FOR: Bill Adams/EPA Region 10
Anne McCauley/EPA Region 10

PREPARED BY: Steve Demus/CH2M HILL

REVIEWED BY: Joan Stoupa/CH2M HILL
Steve Hicks/CH2M HILL
Brian Tracy/CH2M HILL
Rebecca Maco/CH2M HILL

DATE: May 25, 2012

1.0 Introduction

This Technical Memorandum (TM) presents the background, methodology, and results of the Focused Characterization Sampling Program conducted in the Upper Basin of the Coeur d'Alene River from June through August 2011. The Program was conducted at selected mine and mill sites included in the U.S. Environmental Protection Agency's (EPA's) Preferred Remedial Alternative that was presented in the Proposed Plan for the Upper Basin (EPA, 2010). The Program was a cooperative effort involving EPA, the Basin Environmental Improvement Project Commission's Upper Basin Project Focus Team (PFT), the Idaho Department of Environmental Quality (IDEQ), the U.S. Department of the Interior Bureau of Land Management (BLM), and the Asarco Trust group.

The objective of the 2011 Focused Characterization Sampling Program was to obtain information on selected "Contingent Sites" (defined below) by using screening criteria to evaluate whether the sites need to be addressed by remedial actions at this time.

2.0 Background

EPA's Preferred Remedial Alternative presented in the Proposed Plan included proposed remedial actions at 345 mine and mill source sites[1] in the Upper Basin. The Upper Basin boundary is shown in Figure 1.[2] During the public review process for the Proposed Plan, some comments were received suggesting that EPA should further prioritize the cleanup actions included in the Preferred Remedial Alternative, and that some of the listed mine and mill sites may not require remedial actions if additional site characterization and analytical

[1] The Proposed Plan (EPA, 2010) stated that the Preferred Remedial Alternative for OU 3 (Alternative 3+) included 348 sites. This total inadvertently included three sites in Canyon Creek (WAL007, WAL008, and WAL012) that were included in Alternative 4+ but not in Alternative 3+. Therefore, the correct number of mine and mill sites in the Preferred Remedial Alternative is 345.

[2] Referenced figures are provided following Section 7.0, References.

data are collected and compared with site cleanup goals. EPA considered these comments and further evaluated whether the scope of remedial actions should be reduced. The first two stages of this process included grouping sites into categories and subsequent focused characterization sampling, which are described below.

In coordination with the Upper Basin PFT and the overall Basin Commission, EPA grouped the source sites included in the Preferred Remedial Alternative into the following categories:

- **Strong Consensus Sites:** Mine and mill sites where (1) available data have confirmed the presence of contamination and that risks to human health and/or the environment are above acceptable exposure levels, and (2) there is strong agreement among project stakeholders and community representatives that remedial actions are required and appropriate.
- **Active Sites:** Mine and mill sites where active industrial and/or commercial activities are currently occurring, and the owners or activities on these sites currently manage the risk of a release, or potential release, of hazardous substances through regulatory mechanisms outside the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) that enforce compliance with requirements to protect human health and the environment.
- **Remediated Sites:** Mine and mill sites where previous removal or remedial actions have been conducted, remedial effectiveness monitoring is ongoing and subject to CERCLA Five-Year Review requirements, and the need for additional actions has yet to be determined.
- **Contingent Sites:** Mine and mill sites where (1) there may be localized adverse impacts, but the sites are typically located in drainage areas with water quality that is close to or meets cleanup criteria; and/or (2) additional information is needed to make informed remedial decisions.

To establish a process for obtaining needed additional information, EPA, the Upper Basin PFT, IDEQ, BLM, and the Asarco Trust implemented the 2011 Focused Characterization Sampling Program that is described in the remaining sections of this TM.

3.0 Selection of Sites for Focused Characterization Sampling

In conjunction with the Upper Basin PFT, EPA developed a list of 83 candidate mine and mill sites from the Contingent Sites list that needed further characterization to evaluate whether the sites required remedial action at this time. Table 1 lists these 83 candidate sites.[3]

Screening and decision criteria were developed by EPA and the PFT to guide site selection, data collection, and data use. The criteria are shown in Figure 2 and described below. A desktop review of the available information for each site was conducted to establish a subset of sites that were considered for inclusion in the 2011 Focused Characterization Sampling Program.

[3] Referenced tables are presented at the end of this TM, following the figures.

- Step 1: Historical information was reviewed to identify whether ore production had occurred at each candidate site. It was agreed by EPA and the PFT that if ore production had occurred and was documented, this information was sufficient to conclude that waste piles likely existed at the site that were probable sources of contamination; therefore, it would not be necessary to include that site in the Focused Characterization Sampling Program. Sources of information included BLM and Idaho Geological Survey reports, historical reports, and documents at the Wallace District Mining Museum located in Wallace, Idaho.
- Step 2: The information obtained about ore production was evaluated as follows:
  - If ore production had occurred at a site, the site was excluded from the 2011 Focused Characterization Sampling Program and retained for potential remedial action, with the acknowledgement that additional data review and/or characterization of this site may be performed in the future.
  - The information obtained indicated that ore production had occurred at nine of the 83 candidate Contingent Sites. These nine sites, which are shown in boldface in Table 1, were not included in the 2011 Focused Characterization Sampling Program.
  - If ore production did not occur at a site, the site was included in the 2011 Focused Characterization Sampling Program.

As described in Section 4.0, the field effort for the Program consisted of a physical site inspection and soil sampling of waste piles for arsenic and lead. The field sampling data were reviewed, and arsenic and lead concentrations were compared to decision criteria. The results are presented in full in Section 5.0 and summarized in Section 6.0.

4.0 Field Activities

As the result of the screening described above, 74 sites were selected for inclusion in the 2011 Focused Characterization Sampling Program. Of those 74 sites, 41 were located on public land (i.e., owned by BLM and the U.S. Forest Service) and 33 were located on privately owned property. EPA was able to obtain access agreements with landowners for 24 of the privately owned sites, but was not able to secure such agreements for nine of those sites. Therefore, the total number of sites available to conduct the Focused Characterization Sampling was reduced from 74 to 65.

Sampling was actually conducted at 53 of those 65 sites. Fourteen sites were not sampled because of either access difficulties or lack of time to conduct sampling before the end-of-August deadline, while two additional sites were sampled inadvertently.[4] Therefore, the total number of sampled sites for which data were evaluated as part of the Focused Characterization Sampling Program was 51. The sites are listed in Table 1. Also as indicated in Table 1, no evidence of mining activity was observed at three mine sites (THO023 in the

[4] As documented in Table 2, sampling was mistakenly conducted at two sites (THO018 and WAL063) that were not included in EPA's Preferred Remedial Alternative presented in the Upper Basin Proposed Plan (EPA, 2010) or in the Quality Assurance Project Plan (QAPP) for the Upper Basin Focused Characterization Sampling (CH2M HILL, 2011). These two sites are not included in the decisionmaking process for identifying sites that will be addressed during implementation of the Upper Basin Selected Remedy.

Canyon Creek Watershed, and WAL062 and WAL072 in the Mainstem South Fork Coeur d'Alene River [SFCDR] Watershed).

The number of sites sampled in each of the primary Upper Basin watersheds is indicated below, and the sites are shown by watershed on Figures 3 through 9 respectively.

- Upper SFCDR Watershed – 3 sites
- Canyon Creek Watershed – 9 sites
- Ninemile Creek Watershed – 7 sites
- Big Creek Watershed – 1 site
- Moon Creek Watershed – 4 sites
- Pine Creek Watershed – 13 sites
- Mainstem SFCDR Watershed – 14 sites

Field activities conducted at the sites consisted of a physical site inspection and soil sampling of waste piles. The physical site inspection was conducted to document the general physical features and characteristics of each site to identify any evidence of ore. The inspection also recorded features pertinent to determination of risk and the release (or threatened release) of potential hazardous substances from historical mining activities, such as waste pile erosion, the proximity of waste piles to surface water, the condition and coverage of vegetation, and identification of potential receptors.

Soil sampling was conducted at each waste pile to characterize arsenic and lead concentrations using a multi-incremental sampling approach as described in the *Quality Assurance Project Plan, Upper Coeur d'Alene Basin Focused Characterization Sampling, Shoshone County, Idaho* (QAPP; CHM HILL, 2011). A total of 30 individual samples were collected and uniformly spaced across each waste pile from the ground surface to 1 foot below grade. The individual samples were then composited into a single sample. The composited soil samples were submitted to the EPA Region 10 Manchester Environmental Laboratory for size fractioning (<2.0 millimeters [mm] and 2.0 to 4.0 mm) analysis for Target Analyte List (TAL) metals.

5.0 Analytical Results

Table 2 lists the arsenic and lead concentrations detected in the two soil fractions of each composited soil sample collected. Table 2 also identifies (with boldfacing) whether or not the metals concentrations exceeded decision criteria, which would result in the following:

- If there was no evidence of ore production and metals concentrations in soil were greater than 530 mg/kg for lead and/or 100 mg/kg for arsenic, the site would be retained for potential remedial action.
- If there was no evidence of ore production and metals concentrations in soil were lower than the decision criteria indicated above, the site would be removed from further consideration for remedial action at this time.

The following sections summarize the analytical results by primary Upper Basin watershed. The sampling locations are shown on Figures 3 through 9, which also indicate whether arsenic and/or lead concentrations were above or below the decision criteria.

5.1 Upper SFCDR Watershed

Of the three sites in the Upper SFCDR Watershed where focused characterization soil samples were collected from waste piles, arsenic and lead concentrations were below the decision criteria at two sites. At site MUL006, arsenic and lead concentrations exceeded the decision criteria of 100 mg/kg and 530 mg/kg, respectively, in both soil fractions.

5.2 Canyon Creek Watershed

At the nine sites in the Canyon Creek Watershed where samples were collected, arsenic concentrations did not exceed the decision criterion of 100 mg/kg. Lead concentrations exceeded the decision criterion of 530 mg/kg at four sites (BUR105, BUR134, BUR149, and BUR150) in the <2.0 mm soil fraction. Lead concentrations also exceeded the criterion in the 2.0 to 2.4 mm soil fraction at sites BUR105 and BUR149.

5.3 Ninemile Creek Watershed

At the seven sites in the Ninemile Creek Watershed where samples were collected, arsenic concentrations did not exceed the decision criterion. Lead concentrations exceeded the decision criterion at one site (OSB048) in both soil fractions.

5.4 Big Creek Watershed

Neither arsenic nor lead exceeded their respective decision criteria in the one soil sample collected from the Big Creek Watershed, in either soil fraction.

5.5 Moon Creek Watershed

At the four sites in the Moon Creek Watershed where samples were collected, lead concentrations did not exceed the decision criterion of 530 mg/kg. Arsenic concentrations exceeded the decision criterion of 100 mg/kg at one site (KLE064) in both soil fractions.

5.6 Pine Creek Watershed

At the 13 sites in the Pine Creek Watershed where samples were collected, lead concentrations did not exceed the decision criterion. Arsenic concentrations exceeded the decision criterion at four sites (MAS031 in the East Fork, and TWI012, TWI014, and TWI030 in the West Fork) in the <2.0 mm soil fraction. Arsenic concentrations also exceeded the criterion in the 2.0 to 2.4 mm soil fraction at sites TWI012 and TWI014.

5.7 Mainstem SFCDR Watershed

At the 14 sites in the Mainstem SFCDR Watershed where soil samples were collected, lead concentrations did not exceed the decision criterion. Arsenic concentrations exceeded the decision criterion at one site (KLE016) in both soil fractions.

6.0 Summary of Results

The purpose of the 2011 Focused Characterization Sampling Program was to gather information and data with which to retain sites in or remove sites from the Upper Basin

Preferred Remedial Alternative presented in the Upper Basin Proposed Plan (EPA, 2010). As described in Section 3.0 and illustrated in Figure 2, screening and decision criteria were established to support these potential revisions. The results of the 2011 Focused Characterization Sampling Program indicated the following:

- Arsenic and/or lead concentrations at a total of 39 sites did not exceed the decision criteria. These 39 sites, listed in Table 3, are therefore removed from further consideration for remedial action at this time. The locations of these sites are shown on Figures 3 through 9.
- Also as indicated in Table 3, no evidence of mining activity was observed at three mine sites (THO023 in the Canyon Creek Watershed, and WAL062 and WAL072 in the Mainstem SFCDR Watershed). These sites are also removed from further consideration for remedial action at this time. The locations of these sites are shown on Figures 4 and 9.
- Arsenic and/or lead concentrations at a total of 12 sites exceeded the decision criteria. These 12 sites, listed in Table 4, are therefore retained for potential remedial action. The locations of these sites are shown on Figures 3 through 5 and 7 through 9. (Big Creek, shown in Figure 6, is the only major Upper Basin watershed with no sites in this category.)

Table 5 details these results and accounts for sites using elements of the screening and decision criteria process. In summary, the results of the 2011 Field Characterization Sampling Program for selected mine and mill sites in the Upper Basin indicate that 42 sites and their associated remedial actions should be removed from further consideration for remedial action at this time.

Additional subsequent steps were taken by EPA to further reduce the scope of the Selected Remedy that will be documented in the forthcoming Record of Decision (ROD) Amendment for the Upper Basin of the Coeur d'Alene River. Discussion of the Selected Remedy scope reduction is provided in the *Technical Memorandum: Evaluation of Mine and Mill Source Sites for Removal from the Forthcoming Upper Basin ROD Amendment* (CH2M HILL, 2012).

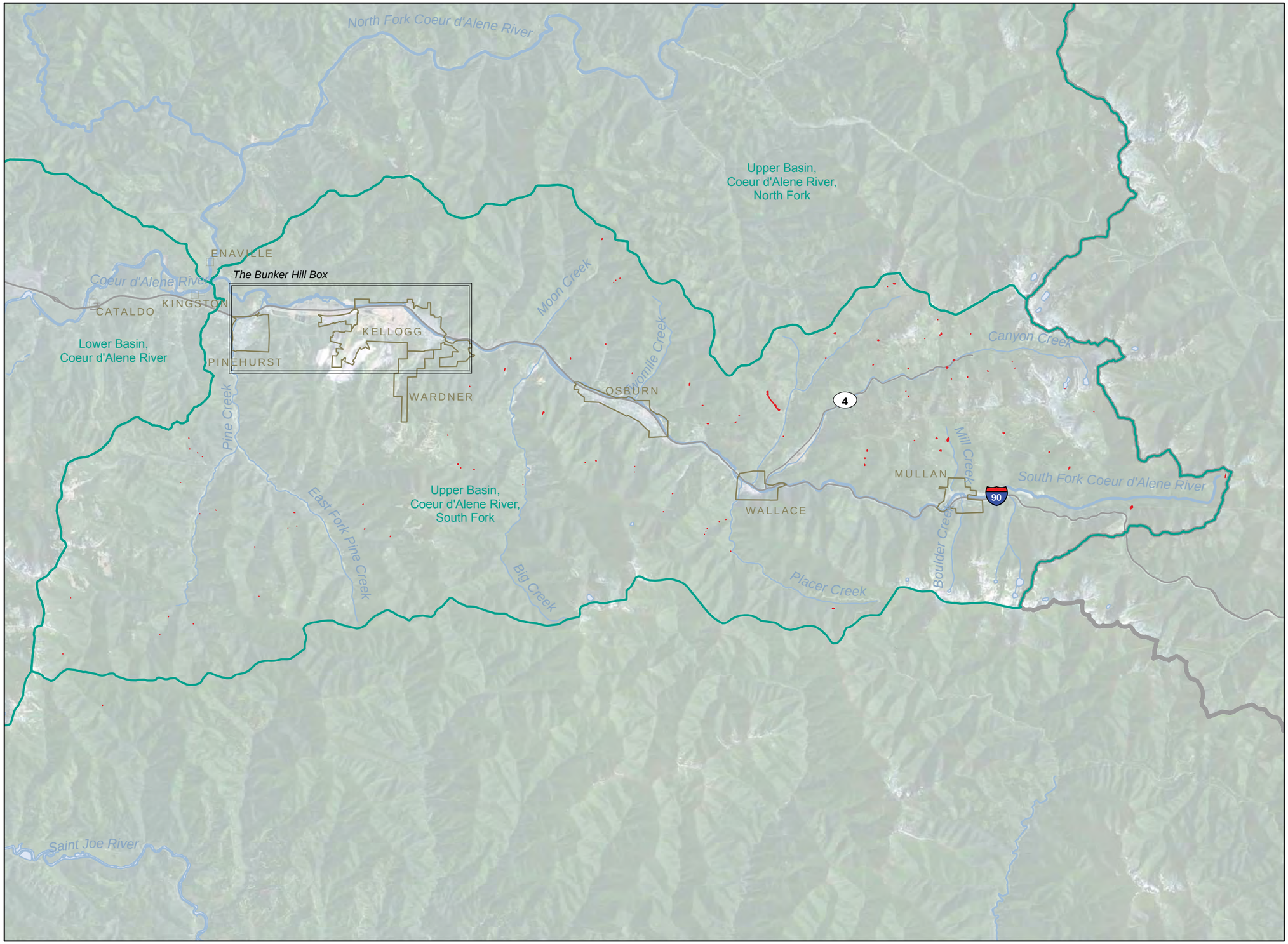
7.0 References

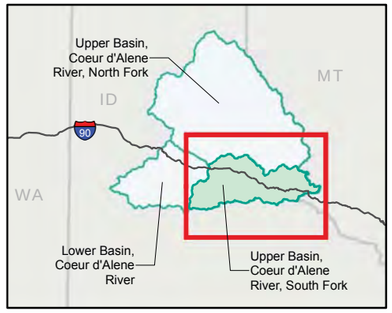
CH2M HILL. April 2011. *Quality Assurance Project Plan, Upper Coeur d'Alene Basin Focused Characterization Sampling, Shoshone County, Idaho.* Prepared for U.S. Environmental Protection Agency Region 10.

CH2M HILL. March 21, 2012. *Draft Technical Memorandum: Evaluation of Mine and Mill Source Sites for Removal from the Forthcoming Upper Basin ROD Amendment.* Prepared for U.S. Environmental Protection Agency Region 10.

U.S. Environmental Protection Agency (EPA). July 12, 2010. *Proposed Plan, Upper Basin of the Coeur d'Alene River, Bunker Hill Mining and Metallurgical Complex Superfund Site.*

Figures





Candidate Site

City Limit

Coeur d'Alene River Subbasin Boundary

State Boundary

Source: ESRI World Imagery

N

0 1 2 4 Miles

Figure 1
Location Map
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE

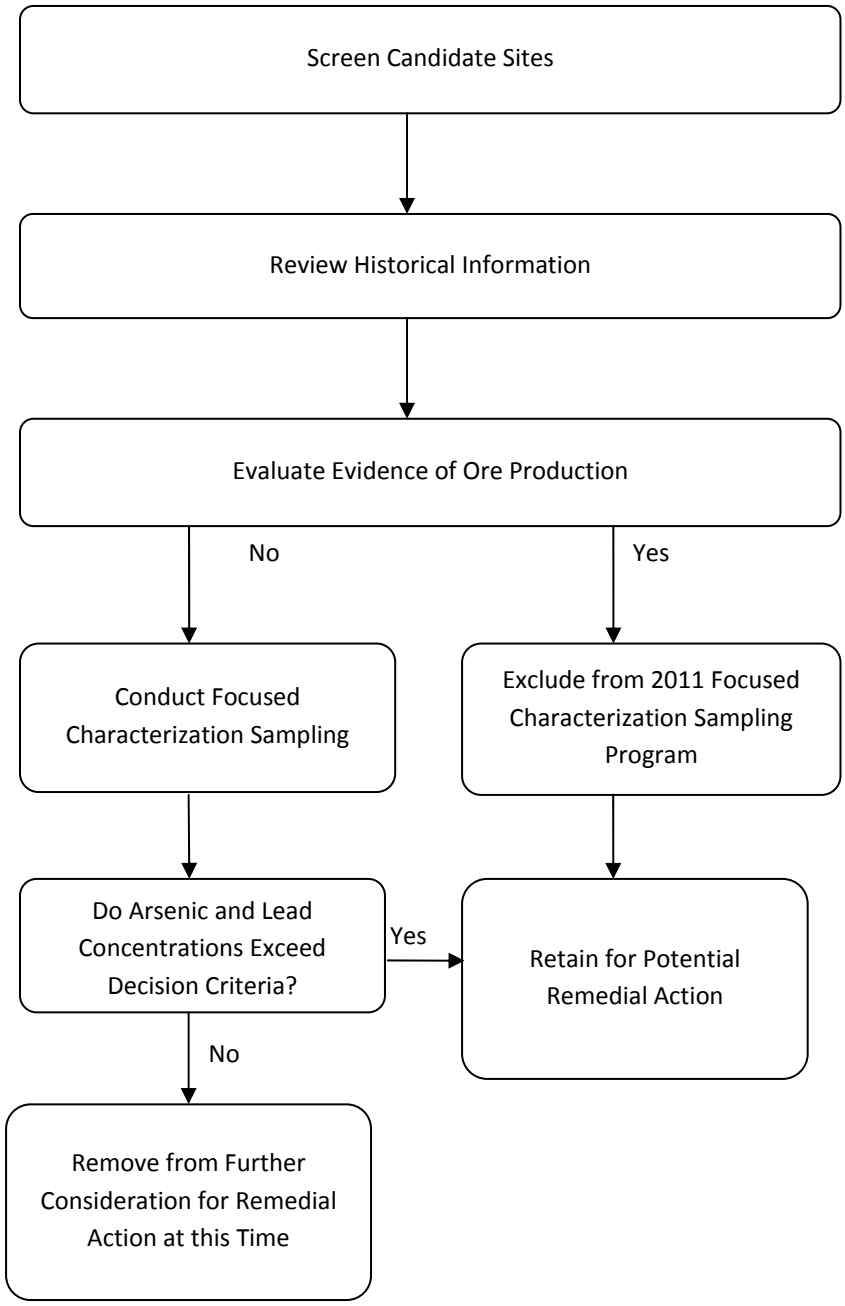
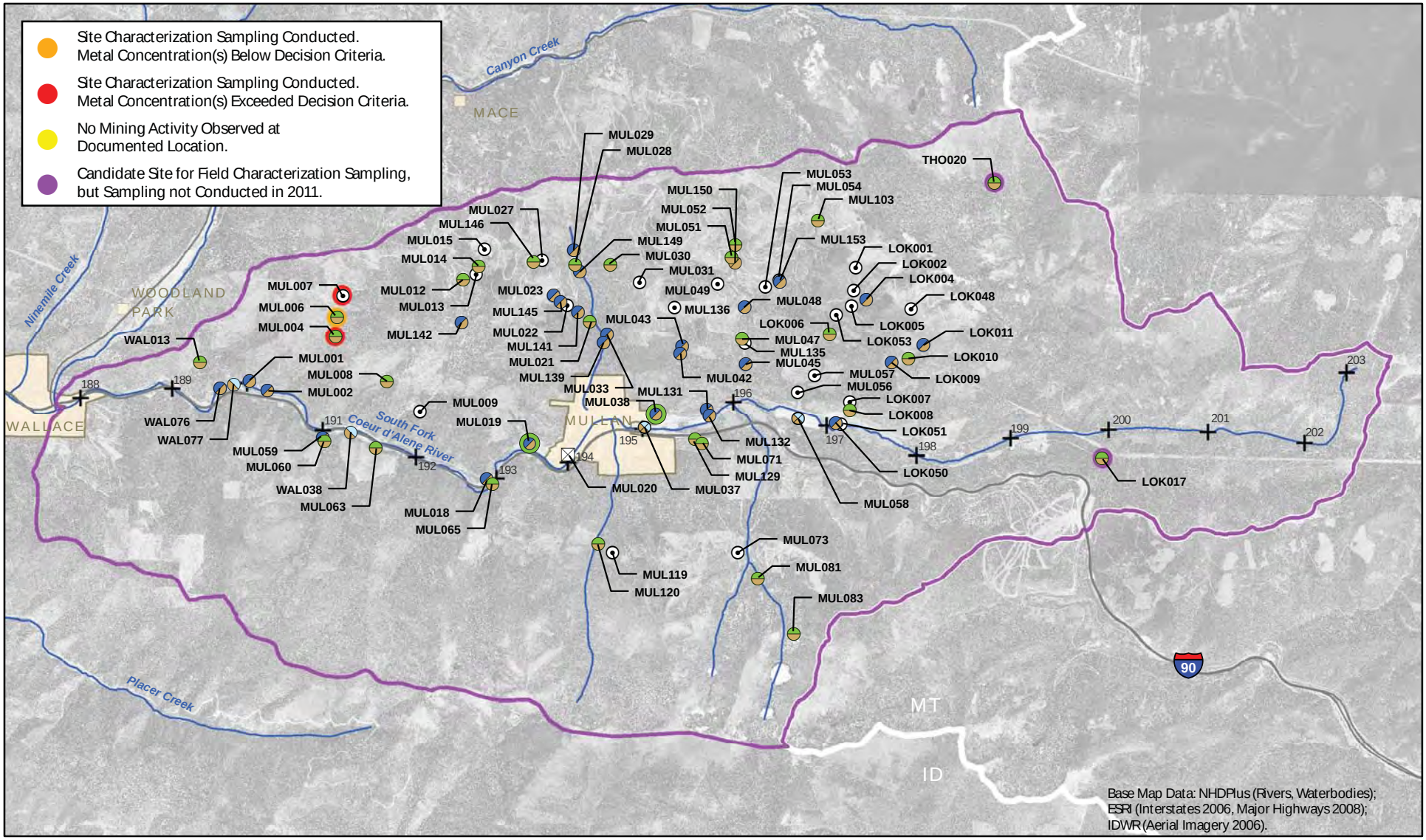
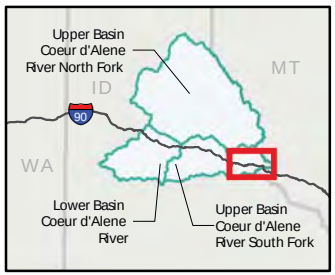


Figure 2
Screening and Decision Criteria for Candidate Sites
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE

Note: Sites with no evidence of mining were also considered for removal from the Preferred Remedial Alternative for the Upper Basin.





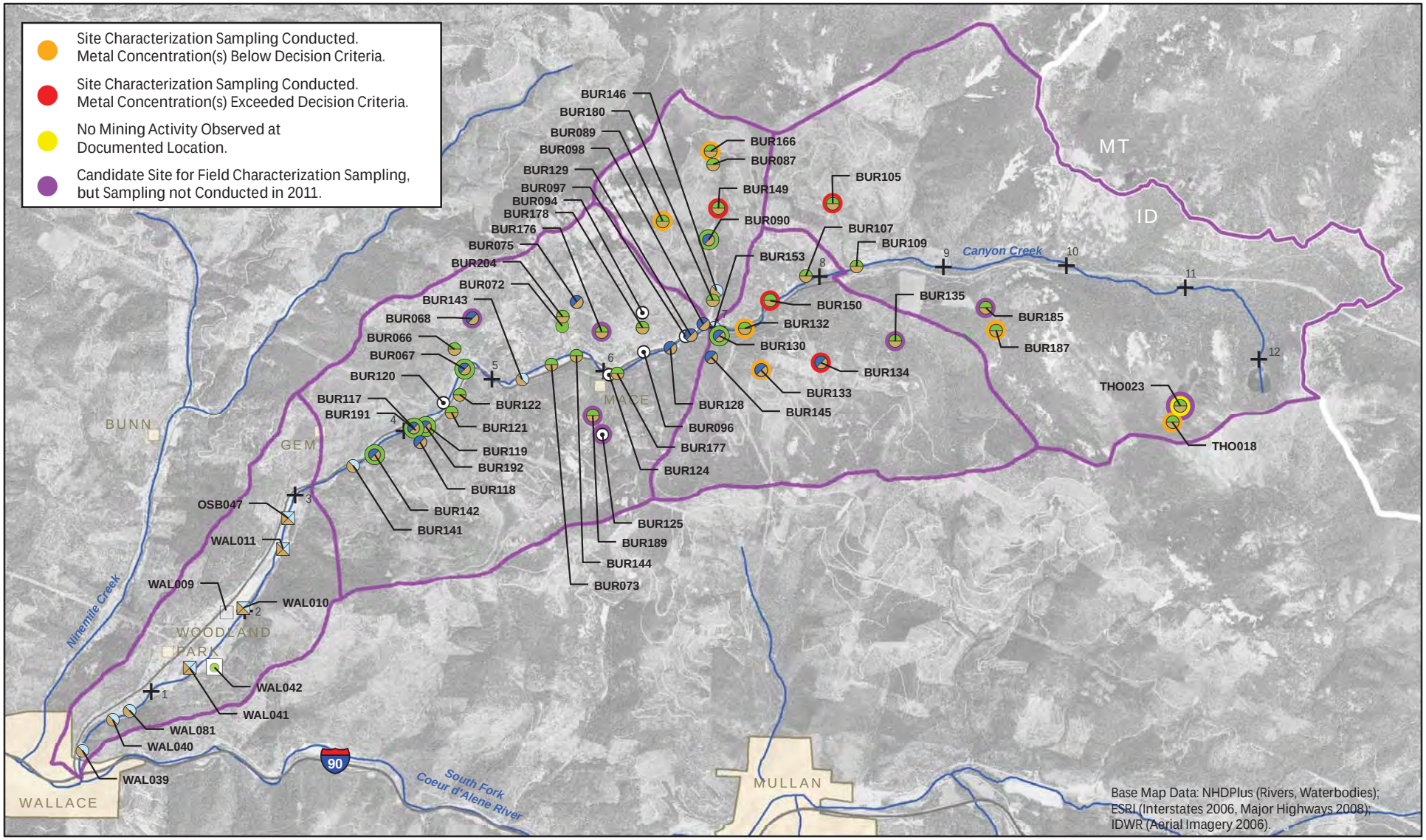
Remedial Action Types Identified in Proposed Plan:

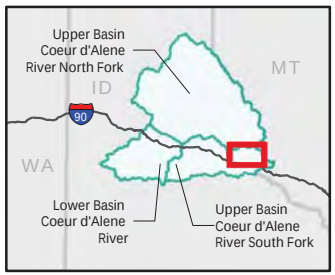
- Excavation/Cap
- Excavation/Cap/Local Waste Consolidation Area
- Excavation/Local Waste Consolidation Area
- Excavation/Repository
- Excavation/Repository; Impoundment Closure
- Impoundment Closure; Hydraulic Isolation
- Regrade/Consolidate/ Revegetate
- LOK011 (Site ID)
- 20 River Mile
- River/Creek
- Watershed Segment
- City Limit
- State Boundary

N

0 0 5 1 Miles

Figure 3
Sites Included in the Focused Characterization Sampling Program: Upper SFCDR Watershed
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE





Remedial Action Types Identified in Proposed Plan:

- Cap/Hydraulic Isolation
- Cap
- Excavation/Cap
- Excavation/Cap/Local Waste Consolidation Area
- Excavation/Local Waste Consolidation Area
- Excavation Repository
- Excavation Repository; Hydraulic Isolation
- Hydraulic Isolation
- Regrade/Consolidate/Revegetate
- **BUR187** (Site ID)
- River Mile
- River/Creek
- Watershed Segment
- City Limit
- State Boundary

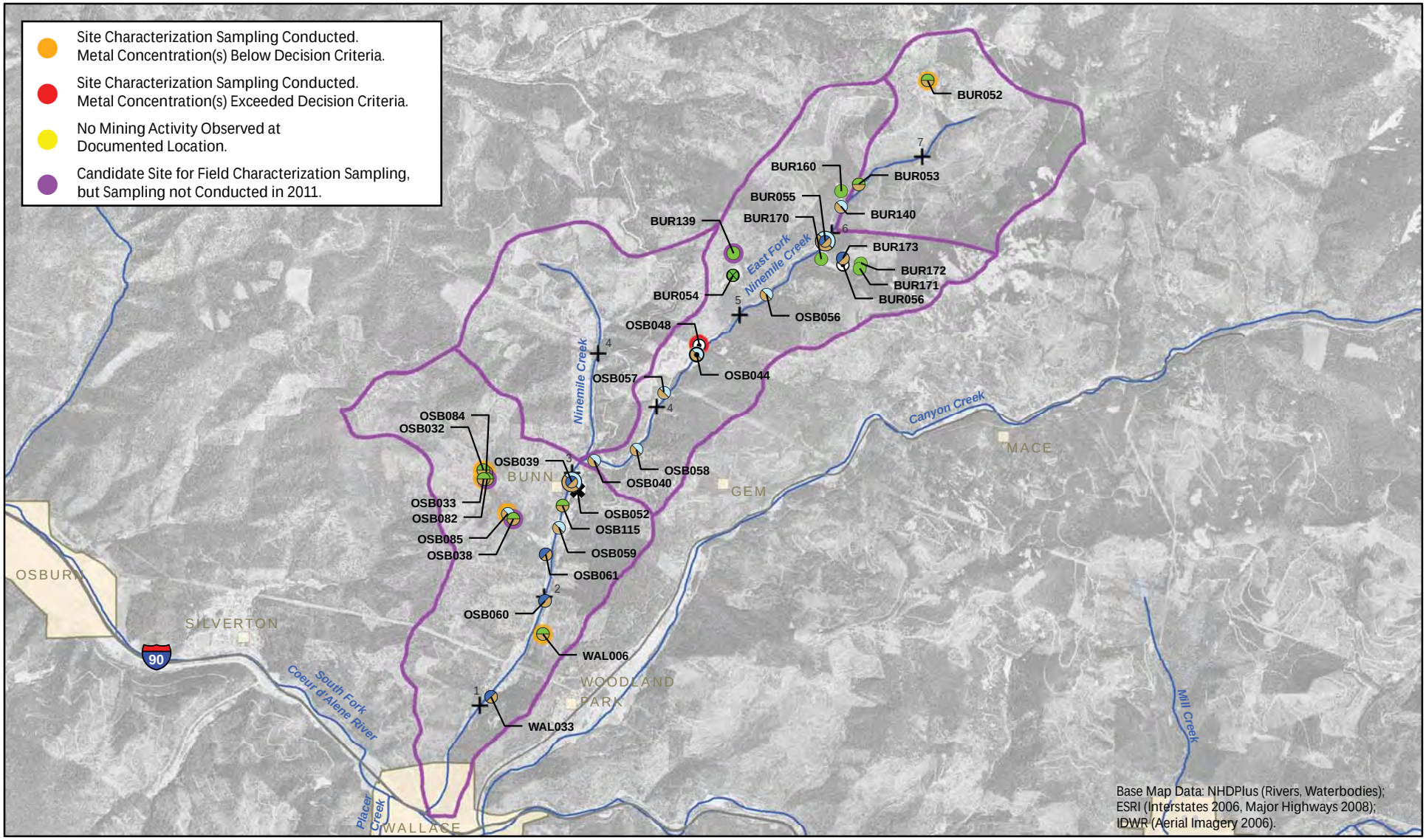
N

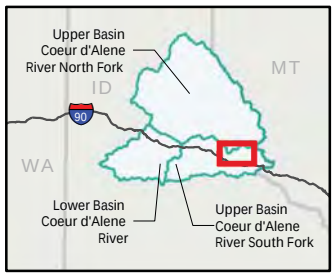
0 0.5 1 Miles

Figure 4
Sites Included in the Focused Characterization Sampling Program: Canyon Creek Watershed
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE

\\JAFAR\PROJ\EPA_BUNKER_401949\MAPFILES\SITES4REMOVAL\CANYONCREEK.MXD SSAVAGE 12/8/2011 2:00:36 PM

EPA





Remedial Action Types Identified in Proposed Plan:

- Cap
- Cap; Impoundment Closure
- Excavation/Cap
- Excavation/Local Waste Consolidation Area
- Excavation/Local Waste Consolidation Area; Excavation/Repository
- Excavation/Repository
- Excavation/Repository; Regrade/Consolidate/ Revegetate
- Impoundment Closure
- Regrade/Consolidate/ Revegetate
- **BUR139** (Site ID)
- River Mile
- River/Creek
- Watershed Segment
- City Limit

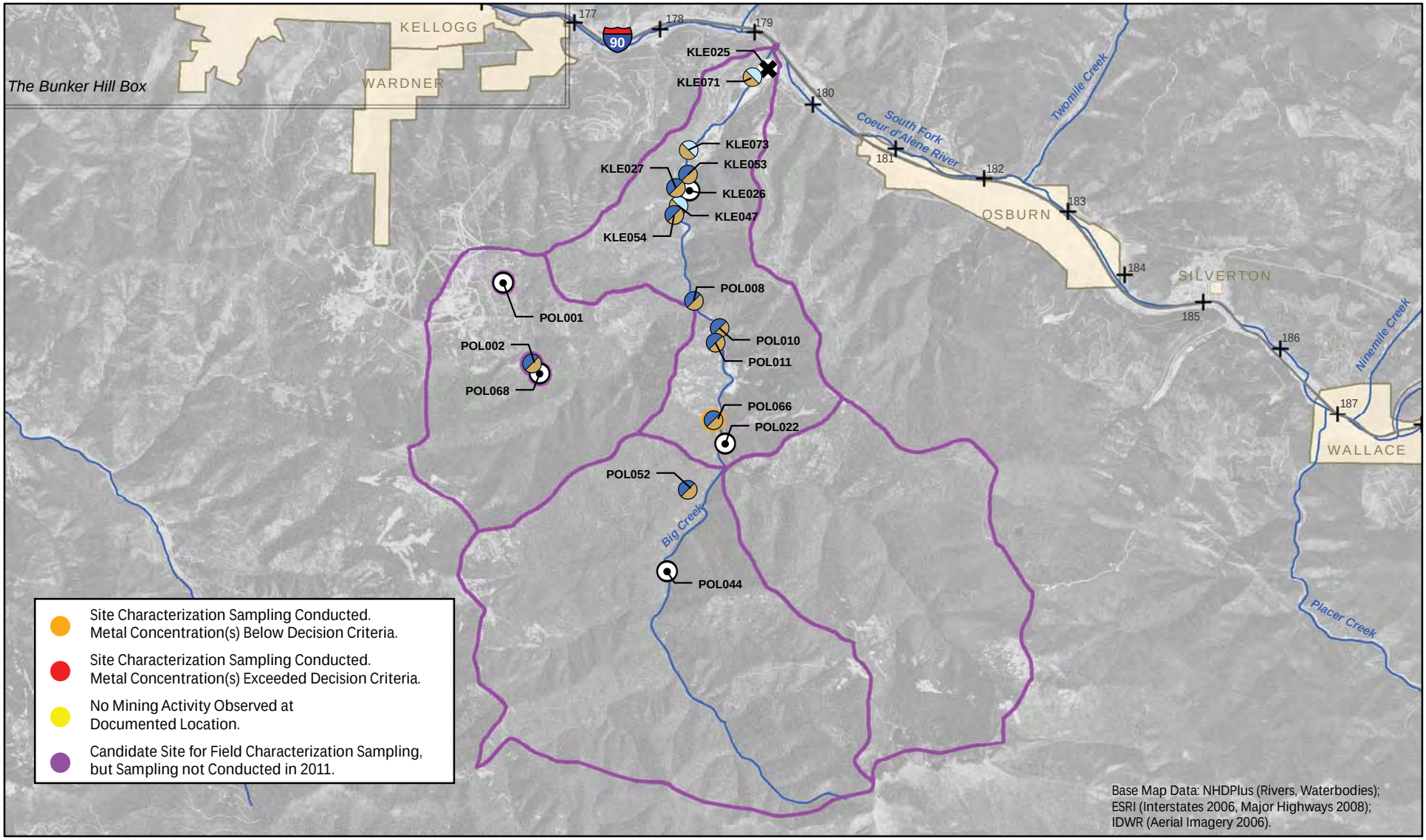
N

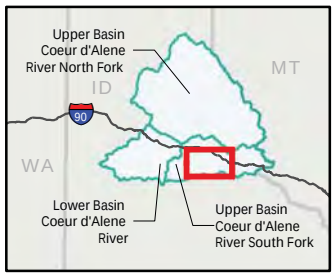
0 0.5 1 Miles

Figure 5
Sites Included in the Focused Characterization Sampling Program: Ninemile Creek Watershed
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE

\\JAFAR\PROJ\EPA_BUNKER_401949\MAPFILES\SITES4REMOVAL\NINEMILECREEK.MXD SSAVAGE1 12/08/2011 2:56:17 PM

EPA





Remedial Action Types Identified in Proposed Plan:

- Excavation/Local Waste Consolidation Area
- Excavation/Regional Repository
- Impoundment Closure
- Regrade/Consolidate/Revegetate
- **POL010** (Site ID)

184 River Mile

River/Creek

Watershed Segment

City Limit

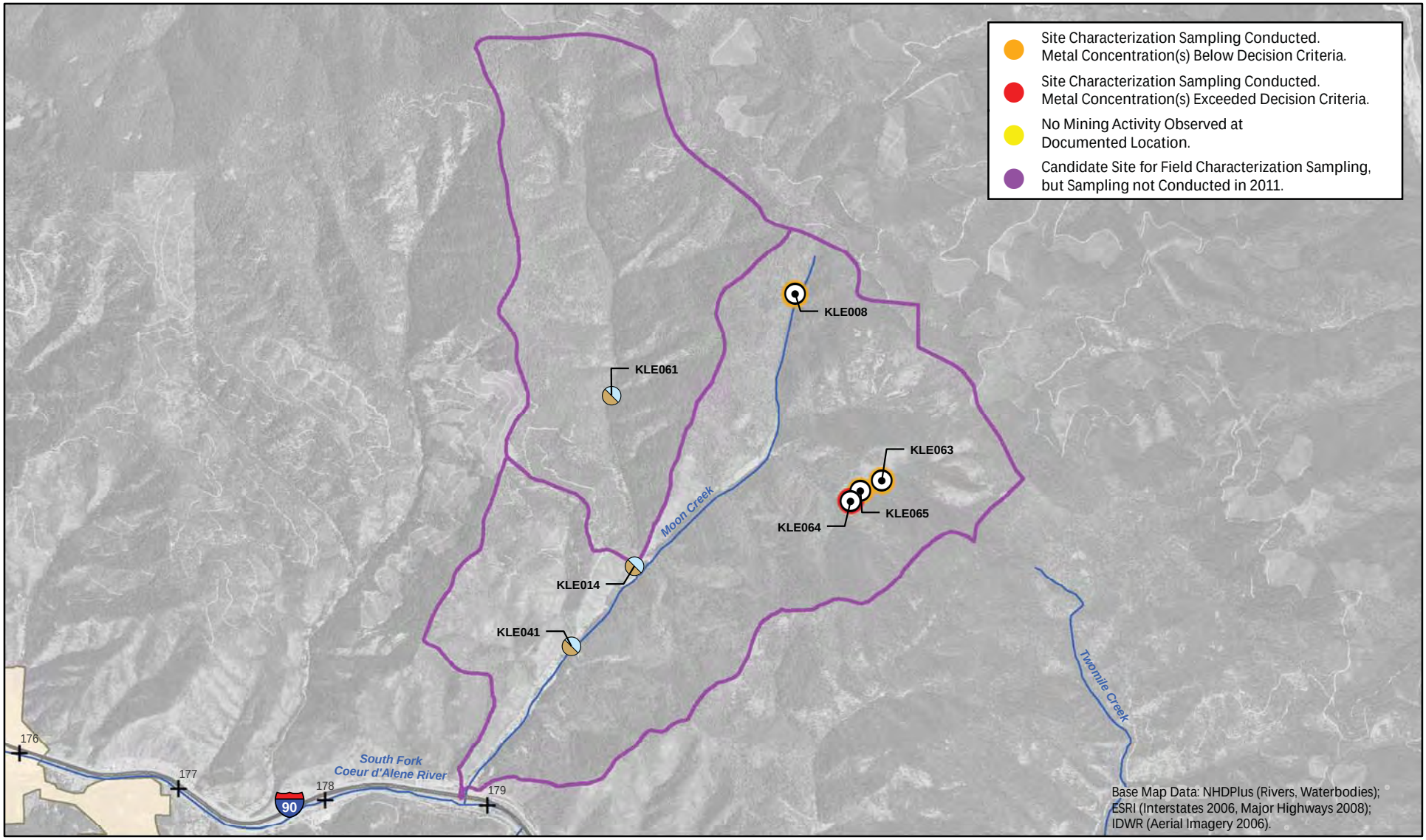
N

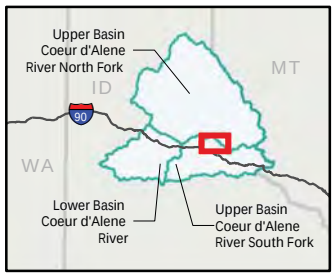
0 0.5 1 Miles

Figure 6
Sites Included in the Focused Characterization Sampling Program: Big Creek Watershed
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE

EPA

\\JAFAR\PROJ\EPA_BUNKER_401949\MAPFILES\SITES4REMOVAL\BIGCREEK.MXD SSAVAGE1 12/08/2011 3:01:35 PM





Remedial Action Types Identified in Proposed Plan:

- Excavation/Regional Repository
- Regrade/Consolidate/Revegetate
- **KLE063** (Site ID)

- 179 River Mile
- River/Creek
- Watershed Segment
- City Limit

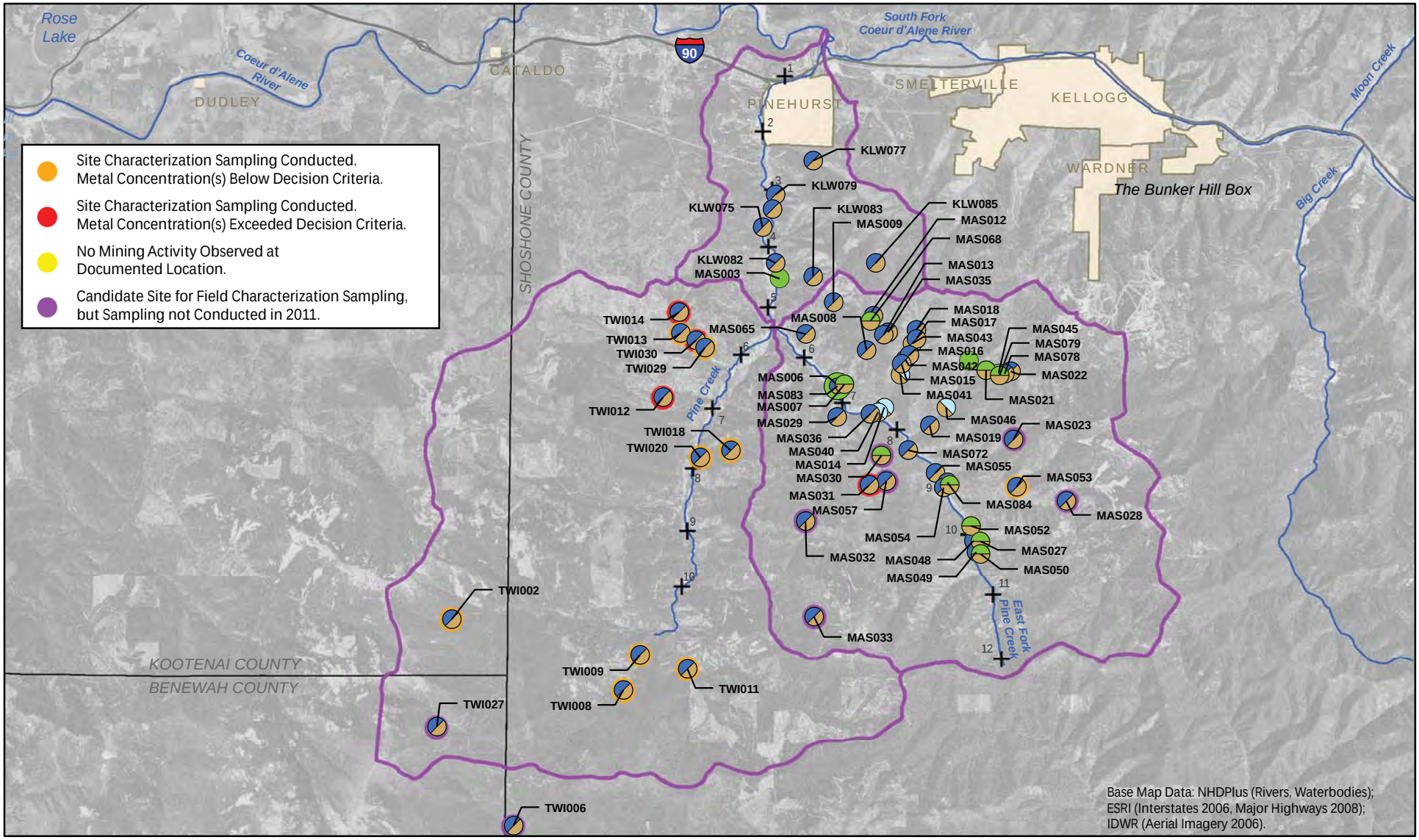
N

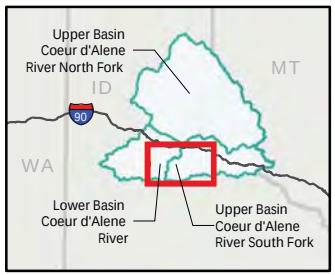
0 0.5 1 Miles

Figure 7
Sites Included in the Focused Characterization Sampling Program: Moon Creek Watershed
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE

\\JAFAR\PROJ\EPA_BUNKER_401949\MAPFILES\SITES4REMOVAL\MOONCREEK.MXD SSAVAGE1 12/08/2011 3:03:28 PM

EPA





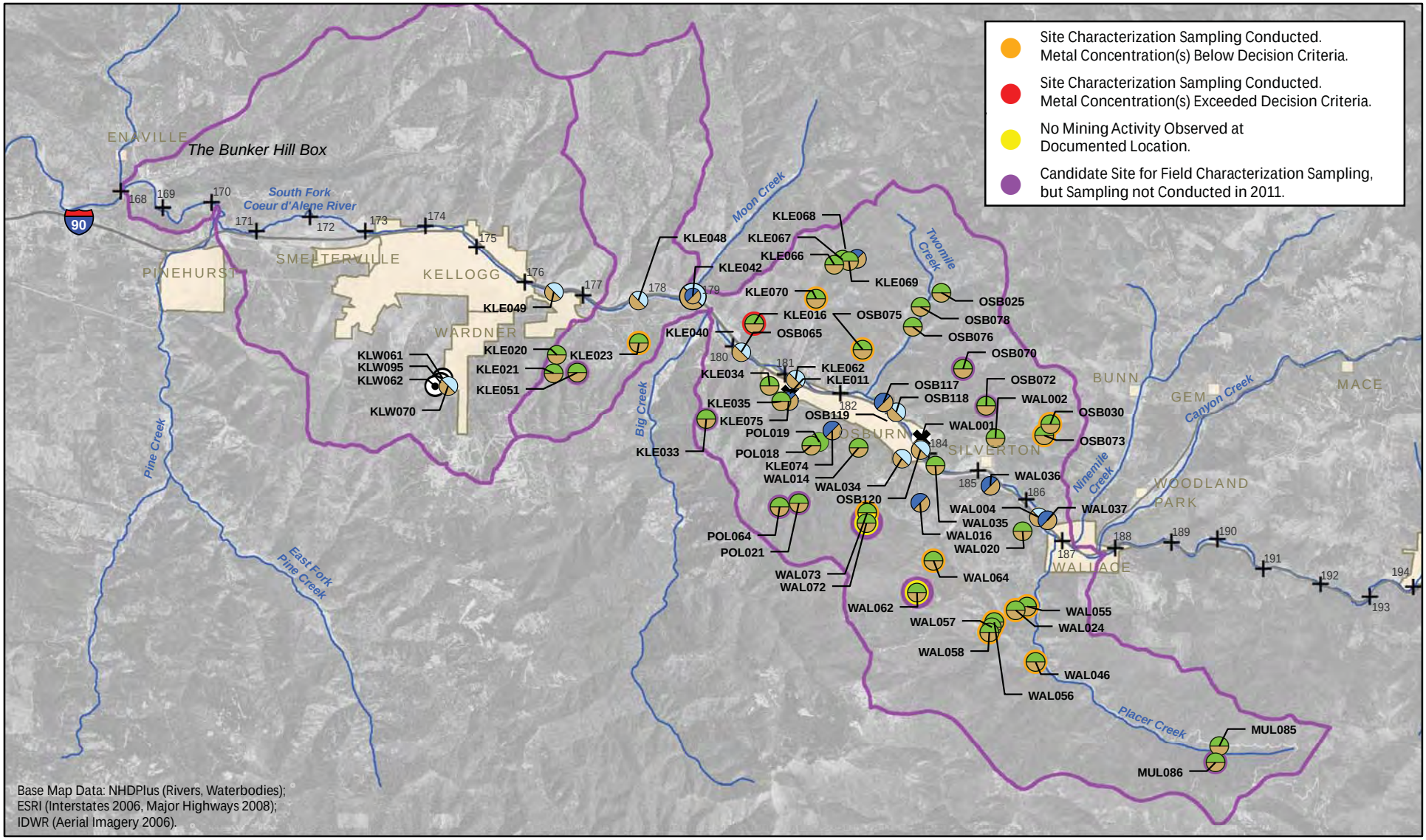
Remedial Action Types Identified in Proposed Plan:

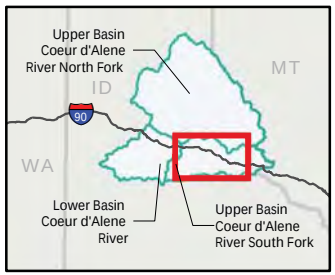
- Cap
- Excavation/Cap
- Excavation/Cap/ Local Repository
- Excavation/Local Repository
- Excavation/Regional Repository
- Impoundment Closure
- **MAS023** (Site ID)
- River Mile
- River/Creek
- Watershed Segment
- City Limit
- County Boundary

N

0 1 2 Miles

Figure 8
Sites Included in the Focused Characterization Sampling Program: Pine Creek Watershed
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE





Remedial Action Types Identified in Proposed Plan:

- Cap
- Excavation/Cap
- Excavation/Local Repository
- Excavation/Local Repository; Excavation/Regional Repository
- Excavation/Regional Repository
- Impoundment Closure
- Regrade/Consolidate/Revegetate
- MUL085 (Site ID)
- 190 River Mile
- River/Creek
- Watershed Segment
- City Limit

N

0 1 2 Miles

Figure 9
Sites Included in the Focused Characterization Sampling Program: Mainstem SFCDR Watershed
Upper Coeur d'Alene Basin
2011 Focused Characterization Sampling
BUNKER HILL SUPERFUND SITE

Tables

TABLE 1

List of Candidate Contingent Sites

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

BLM Site ID	Site Name	Characterization Sampling Conducted
Upper SFCDR Watershed		
LOK017	**Beacon Light**	
MUL004	United Lead Zinc Mine	X
MUL006	Square Deal Mine	X
MUL007	Wonder Mine	X
THO020	Bull Frog Mine	
Canyon Creek Watershed		
THO023	Unnamed Adit	
BUR068	Headlight Mine	
BUR089	Idaho and Eastern Mine	X
BUR105	Oom Paul No. 2	X
BUR125	Midway Summit	
BUR132	Gertie Mine	X
BUR133	Russel Mine	X
BUR134	Alcides Prospect and Imperial Mine	X
BUR135	**Sonora Mine**	
BUR149	Ajax No. 2 Adjacent Rock Dump	X
BUR150	Garbage Dump	X
BUR166	Unnamed Adit	X
BUR176	Unnamed Adit	
BUR185	**West Mammoth Mine**	
BUR187	Unnamed Adit	X
BUR189	Duluth Mine Canyon Creek	
Ninemile Creek Watershed		
WAL006	Northside Mine	X
BUR052	Little Sunset Mine	X
BUR139	**Rex No. 1**	
OSB032	Duluth Mine Blackcloud Creek	X
OSB033	Ruth Mine	X
OSB038	**California No. 4**	
OSB048	American Mine	X
OSB082	**Monarch Mine Blackcloud Creek**	
OSB084	Blackcloud Creek Impacted Riparian	X
OSB085	Blackcloud Creek Impacted Riparian	X
Big Creek Watershed		
POL001	Sunshine Consolidated Rockford Group	
POL002	Silver Dale and Big Hill Mine	
POL066	Unnamed Adit	X
POL068	Unnamed Adit	
Moon Creek Watershed		
KLE008	Maine-Standard Mine	X
KLE063	Unnamed Adit	X
KLE064	Unnamed Adit	X
KLE065	Unnamed Adits	X
Pine Creek Watershed (East Fork)		
MAS023	Blue Eagle Mine	
MAS028	Lon Chaney Group	
MAS030	Trapper Creek Silver	
MAS031	Trapper Mining & Smelting Company Ltd.	X
MAS032	L and J Prospect	
MAS033	Coeur d'Alene Premier	
MAS053	Unnamed Adits	X

TABLE 1

List of Candidate Contingent Sites

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

BLM Site ID	Site Name	Characterization Sampling Conducted
MAS057	Unnamed Adit	
Pine Creek Watershed (West Fork)		
TWI002	Palisade Mine Lower Workings	X
TWI006	Manhattan Mine	
TWI008	West Pine Creek Deposit	X
TWI009	Equitable Prospect	X
TWI011	Unnamed Adit	X
TWI012	KC Prospect	X
TWI013	Bluebird Prospect (Hannibal)	X
TWI014	Great Dunkard Mine	X
TWI018	Unnamed Prospect	X
TWI020	Unnamed Adit	X
TWI027	Unnamed Prospect	
TWI029	Unnamed Adit	X
TWI030	Unnamed Adit	X
Mainstem SFCDR Watershed		
KLE016	Syndicate Mining & Exploration Co.	X
KLE023	Pioneer Mines Inc. Property	X
KLE033	**Polaris Mine**	
KLE051	**Florence Mine**	
KLE070	Unnamed Adit	X
MUL086	Wibberding-Golden Slipper Mines	
POL021	Eclipse Mine	
POL064	Unnamed Adit	
WAL024	War Eagle Mine	X
WAL046	Day Mines Claims	X
WAL055	Unnamed Adit	X
WAL056	Peerless Group (Osceola)	X
WAL057	Peerless Group	X
WAL058	Unnamed Adit	X
WAL062	Unnamed Adit	
WAL064	Unnamed Adit	X
WAL072	Unnamed Adit	
WAL073	Unnamed Adit	X
OSB030	Silverton Prospect Upper Adit	X
OSB070	Silverore-Inspiration Mine	
OSB072	**Western Union Upper Adit**	
OSB073	Silverton Prospect Lower Adit	X
OSB075	Unnamed Adit	X

Notes:

Sites were selected for data collection in response to comments received on the Upper Basin Proposed Plan regarding mine and mill sites identified for cleanup. The list of sites was developed by the U.S. Environmental Protection Agency (EPA) and the Upper Basin Project Focus Team (PFT) and based on the lack of ore production and the limited knowledge of these sites. BLM = Bureau of Land Management; SFCDR = South Fork of the Coeur d'Alene River.

Boldfaced sites were removed from the field characterization sampling effort based on the site selection criteria described in Section 3.0 of this Technical Memorandum.

The Characterization Sampling Conducted column shows the sites that were sampled in 2011. These sites are identified with an X. Sites that were not sampled are not given an identifier. These sites were either removed from the field characerization sampling effort based on the site selection criteria; or were not sampled due to lack of private property access, no direct physical access, no observed mining disturbance, or schedule limitations.Three sites were not sampled, but were verified in the field as having no observed mining disturbance (i.e., THO023, WAL062, and WAL072).

TABLE 2

Waste Pile Analytical Results

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

BLM Site ID[a]	Site Name	<2.0 mm Soil Fraction			2.0-4.0 mm Soil Fraction		
		% Mass of Bulk Sample	Arsenic (mg/kg)	Lead (mg/kg)	% Mass of Bulk Sample	Arsenic (mg/kg)	Lead (mg/kg)
Decision Criteria [b]			*100 mg/kg*	*530 mg/kg*		*100 mg/kg*	*530 mg/kg*
Upper SFCDR Watershed							
MUL004	United Lead Zinc Mine	47.5%	5.9	22.7	13.2%	U	4.4
MUL006	Square Deal Mine	44.5%	178[c]	3,160	13.9%	144	1,620
MUL007	Wonder Mine	48.6%	6.3	53.6	9.5%	U	12.9
Canyon Creek Watershed							
THO018[d]	Unnamed Adit	40.3%	6	51.9	21.3%	U	92.1
BUR089	Idaho and Eastern Mine	62.8%	9.9	34.9	8.2%	U	12.4
BUR105	Oom Paul No. 2	33.7%	13	1,920	18.2%	4.9	1,710
BUR132	Gertie Mine	40.3%	8.6	19.5	19.9%	U	6.0
BUR133	Russel Mine	53.8%	4.9	33.3	12.0%	U	11
BUR134	Alcides Prospect and Imperial Mine	41.1%	8.9	762	19.6%	5.4	170
BUR149	Ajax No. 2 Adjacent Rock Dump	31.5%	16	1,690	19.9%	6.1	2,040
BUR150	Garbage Dump	36.6%	33.2	2,500	15.8%	12	431
BUR166	Unnamed Adit	35.5%	24.5	187	16.5%	11	45.9
BUR187	Unnamed Adit	34.5%	5.1	21.2	18.8%	4.9	31.4
Ninemile Creek Watershed							
WAL006	Northside Mine	62.2%	6.8	44.7	9.4%	U	16.1
BUR052	Little Sunset Mine	24.5%	26.2	98.2	15.9%	U	7.7
OSB032	Duluth Mine Blackcloud Creek	49.2%	U	26.5	14.1%	U	6.0
OSB033	Ruth Mine	36.7%	6.4	23.8	16.5%	U	6.9
OSB048	American Mine	41.3%	14	606	10.0%	22.7	1,490
OSB084	Blackcloud Creek Impacted Riparian	34.0%	U	17.1	15.8%	U	13.2
OSB085	Blackcloud Creek Impacted Riparian	42.4%	4.9	325	16.3%	U	465
Big Creek Watershed							
POL066	Unnamed Adit	38.4%	5.9	14.0	16.5%	U	3.2
Moon Creek Watershed							
KLE008	Maine-Standard Mine	47.0%	55.1	33.1	19.3%	14	9.6
KLE063	Unnamed Adit	53.9%	22.5	58.5	13.0%	23.4	34
KLE064	Unnamed Adit	38.0%	554	51	16.2%	168	16.3
KLE065	Unnamed Adits	39.2%	40.5	54.8	17.1%	14	11
Pine Creek Watershed (East Fork)							
MAS031	Trapper Mining & Smelting Company Ltd.	33.7%	164	78.4	17.9%	54.1	32.4
MAS053	Unnamed Adits	39.3%	8.7	32.3	11.4%	7.2	15.7
Pine Creek Watershed (West Fork)							
TWI002	Palisade Mine Lower Workings	49.4%	U	11.0	10.4%	7.2	7.3
TWI008	West Pine Creek Deposit	45.6%	5.0	22.5	11.2%	4.9	6.1
TWI009	Equitable Prospect	36.4%	5.7	11.0	14.8%	U	U
TWI011	Unnamed Adit	34.6%	5.0	18.3	13.4%	U	3.5
TWI012	KC Prospect	42.3%	2,010	315	15.9%	5,180	199
TWI013	Bluebird Prospect (Hannibal)	58.6%	76.3	46.3	14.1%	85.5	27.9
TWI014	Great Dunkard Mine	45.3%	1,060	31.9	14.3%	776	18.8

TABLE 2

Waste Pile Analytical Results

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

BLM Site ID[a]	Site Name	<2.0 mm Soil Fraction			2.0-4.0 mm Soil Fraction		
		% Mass of Bulk Sample	Arsenic (mg/kg)	Lead (mg/kg)	% Mass of Bulk Sample	Arsenic (mg/kg)	Lead (mg/kg)
TWI018	Unnamed Prospect	25.6%	26.9	33.7	14.6%	8.5	4.4
TWI020	Unnamed Adit	50.3%	30.3	117	15.3%	28	78.5
TWI029	Unnamed Adit	45.7%	24.9	70.8	20.1%	24.3	52.3
TWI030	Unnamed Adit	30.3%	243	110	13.0%	35.9	23.4
Mainstem SFCDR Watershed							
KLE016	Syndicate Mining & Exploration Co.	66.7%	140	150	4.3%	114	35.4
KLE023	Pioneer Mines Inc. Property	32.7%	9.5	45.5	12.7%	9.4	27
KLE070	Unnamed Adit	43.0%	19	44	12.1%	16	20
WAL024	War Eagle Mine	71.3%	16	12.9	16.3%	13	7.7
WAL046	Day Mines Claims	41.8%	32.4	234	16.7%	19	79.9
WAL055	Unnamed Adit	29.0%	26.9	55.4	9.9%	21	18.8
WAL056[e]	Peerless Group (Osceola)	52.4%	15	28	12.0%	13	11
		55.8%	26.3	9.2	19.4%	12	U
WAL057	Peerless Group	47.2%	9.9	15.9	15.1%	5.8	U
WAL058	Unnamed Adit	35.1%	16	26.5	9.9%	7	12
WAL063[f]	Unnamed Adit	42.8%	U	19.3	13.2%	U	U
WAL064	Unnamed Adit	51.3%	6.1	56.3	13.3%	U	28.6
WAL073[g]	Unnamed Adit	50.5%	5.9	29.9	8.6%	U	4.3
OSB030	Silverton Prospect Upper Adit	39.5%	5.2	51.3	16.9%	U	8.4
OSB073[e]	Silverton Prospect Lower Adit	40.8%	11	115	12.1%	9.5	45.3
		34.3%	12	50.8	17.1%	U	5.2
OSB075	Unnamed Adit	40.8%	26.4	100	16.7%	24.9	43.1

Notes:

[a] Sites selected for data collection in response to comments received on the Upper Basin Proposed Plan regarding mine and mill sites identified for cleanup. The list of sites was generated by the U.S. Environmental Protection Agency (EPA) and the Upper Basin Project Focus Team (PFT) and based on the lack of ore production and limited knowledge of these sites.

[b] Decision criteria were established in the Quality Assurance Project Plan (QAPP) for the Upper Basin Focused Characterization Sampling (CH2M HILL, 2011) and consisted of the following: (1) If there is no evidence of ore production and concentrations in soil are greater than 530 mg/kg for lead and/or 100 mg/kg for arsenic, the site will be retained in the Upper Basin Preferred Alternative; and (2) if there is no evidence of ore production and concentrations in soil are less than 530 mg/kg for lead and/or 100 mg/kg for arsenic, the site will potentially be removed from the Upper Basin Preferred Alternative.

[c] Bold values indicate concentrations exceeding the decision criteria. A shaded row indicates the site will be retained in the Upper Basin Preferred Alternative.

[d] Field characterization sampling was conducted at THO018 instead of THO023. No mining activity was observed at the THO023 location. These two sites are located in close proximity to each other, and THO018 was mistaken for THO023. THO018 was not included in the QAPP for the Upper Basin Focused Characterization Sampling (CH2M HILL, 2011).

[e] Two soil samples were collected at each of the sites WAL056 and OSB073 because evidence of two discrete mining-impacted areas was observed at these sites.

[f] Field characterization sampling was conducted at WAL063 instead of WAL062. No mining activity was observed at the WAL062 location. These two sites are located in close proximity to each other, and the only mining activity in this area was observed at WAL063. WAL063 was not included in the QAPP for the Upper Basin Focused Characterization Sampling (CH2M HILL, 2011).

[g] No mining activity was observed at the WAL072 location.

BLM = Bureau of Land Management; mm = millimeter(s); mg/kg = milligram(s) per kilogram; SFCDR = South Fork of the Coeur d'Alene River; U = nondetect.

TABLE 3

Sites with Metals Concentrations Below Decision Criteria[a]

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

BLM Site ID	Site Name	<2.0 mm Soil Fraction		2.0-4.0 mm Soil Fraction	
		Arsenic (mg/kg)	Lead (mg/kg)	Arsenic (mg/kg)	Lead (mg/kg)
Upper SFCDR Watershed					
MUL004	United Lead Zinc Mine	5.9	22.7	U	4.4
MUL007	Wonder Mine	6.3	53.6	U	12.9
Canyon Creek Watershed					
BUR089	Idaho and Eastern Mine	9.9	34.9	U	12.4
BUR132	Gertie Mine	8.6	19.5	U	6.0
BUR133	Russel Mine	4.9	33.3	U	11
BUR166	Unnamed Adit	24.5	187	11	45.9
BUR187	Unnamed Adit	5.1	21.2	4.9	31.4
THO023[b]	Unnamed Adit	--	--	--	--
Ninemile Creek Watershed					
WAL006	Northside Mine	6.8	44.7	U	16.1
BUR052	Little Sunset Mine	26.2	98.2	U	7.7
OSB032	Duluth Mine Blackcloud Creek	U	26.5	U	6.0
OSB033	Ruth Mine	6.4	23.8	U	6.9
OSB084	Blackcloud Creek Impacted Riparian	U	17.1	U	13.2
OSB085	Blackcloud Creek Impacted Riparian	4.9	325	U	465
Big Creek Watershed					
POL066	Unnamed Adit	5.9	14.0	U	3.2
Moon Creek Watershed					
KLE008	Maine-Standard Mine	55.1	33.1	14	9.6
KLE063	Unnamed Adit	22.5	58.5	23.4	34
KLE065	Maine-Standard Mine	40.5	54.8	14	11
Pine Creek Watershed (East Fork)					
MAS053	Unnamed Adits	8.7	32.3	7.2	15.7
Pine Creek Watershed (West Fork)					
TWI002	Palisade Mine Lower Workings	U	11.0	7.2	7.3
TWI008	West Pine Creek Deposit	5.0	22.5	4.9	6.1
TWI009	Equitable Prospect	5.7	11.0	U	U
TWI011	Unnamed Adit	5.0	18.3	U	3.5
TWI013	Bluebird Prospect (Hannibal)	76.3	46.3	85.5	27.9
TWI018	Unnamed Prospect	26.9	33.7	8.5	4.4
TWI020	Unnamed Adit	30.3	117	28	78.5
TWI029	Unnamed Adit	24.9	70.8	24.3	52.3
Mainstem SFCDR Watershed					
KLE023	Pioneer Mines Inc. Property	9.5	45.5	9.4	27
KLE070	Unnamed Adit	19	44	16	20
WAL024	War Eagle Mine	16	12.9	13	7.7
WAL046	Day Mines Claims	32.4	234	19	79.9
WAL055	Unnamed Adit	26.9	55.4	21	18.8
WAL056	Peerless Group (Osceola)	15	28	13	11
		26.3	9.2	12	U
WAL057	Peerless Group	9.9	15.9	5.8	U

TABLE 3

Sites with Metals Concentrations Below Decision Criteria[a]

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

BLM Site ID	Site Name	<2.0 mm Soil Fraction		2.0-4.0 mm Soil Fraction	
		Arsenic (mg/kg)	Lead (mg/kg)	Arsenic (mg/kg)	Lead (mg/kg)
WAL058	Unnamed Adit	16	26.5	7	12
WAL062[b]	Unnamed Adit	--	--	--	--
WAL064	Unnamed Adit	6.1	56.3	U	28.6
WAL072[b]	Unnamed Adit	--	--	--	--
WAL073	Unnamed Adit	5.9	29.9	U	4.3
OSB030	Silverton Prospect Upper Adit	5.2	51.3	U	8.4
OSB073	Silverton Prospect Lower Adit	11	115	9.5	45.3
		12	50.8	U	5.2
OSB075	Unnamed Adit	26.4	100	24.9	43.1

Notes:

[a] Decision criteria were established in the Quality Assurance Project Plan (QAPP) for the Upper Basin Focused Characterization Sampling (CH2M HILL, 2011) and consisted of the following: (1) If there is no evidence of ore production and concentrations in soil are greater than 530 mg/kg for lead and/or 100 mg/kg for arsenic, the site will be retained in the Upper Basin Preferred Alternative; and (2) if there is no evidence of ore production and concentrations in soil are less than 530 mg/kg for lead and/or 100 mg/kg for arsenic, the site will potentially be removed from the Upper Basin Preferred Alternative.

[b] No waste piles or other mining disturbances were observed in the vicinity of the documented site location; therefore, the site is recommended for removal from the Upper Basin Preferred Alternative.

BLM = Bureau of Land Management
-- = Not sampled
mm = millimeter(s)
mg/kg = milligram(s) per kilogram
SFCDR = South Fork of the Coeur d'Alene River
U = Nondetect

TABLE 4

Sites with Metals Concentrations Exceeding Decision Criteria[a]

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

BLM Site ID	Site Name	<2.0 mm Soil Fraction		2.0-4.0 mm Soil Fraction		Decision Criteria Exceedence Parameter
		Arsenic (mg/kg)	Lead (mg/kg)	Arsenic (mg/kg)	Lead (mg/kg)	
Upper SFCDR Watershed						
MUL006	Square Deal Mine	**178**[b]	3,160	144	1,620	Arsenic and Lead
Canyon Creek Watershed						
BUR105	Oom Paul No. 2	13	1,920	4.9	1,710	Lead
BUR134	Alcides Prospect and Imperial Mine	8.9	762	5.4	170	Lead
BUR149	Ajax No. 2 Adjacent Rock Dump	16	1,690	6.1	2,040	Lead
BUR150	Garbage Dump	33.2	2,500	12	431	Lead
Ninemile Creek Watershed						
OSB048	American Mine	14	606	22.7	1,490	Lead
Moon Creek Watershed						
KLE064	Unnamed Adit	554	51	168	16	Arsenic
Pine Creek Watershed (East Fork)						
MAS031	Trapper Mining & Smelting Company Ltd.	164	78.4	54.1	32.4	Arsenic
Pine Creek Watershed (West Fork)						
TWI012	KC Prospect	2,010	315	5,180	199	Arsenic
TWI014	Great Dunkard Mine	1,060	31.9	776	18.8	Arsenic
TWI030	Unnamed Adit	243	110	35.9	23.4	Arsenic
Mainstem SFCDR Watershed						
KLE016	Syndicate Mining & Exploration Co.	140	150	114	35.4	Arsenic

Notes:

[a] Decision criteria were established in the Quality Assurance Project Plan (QAPP) for the Upper Basin Focused Characterization Sampling (CH2M HILL, 2011) and consisted of the following: (1) If there is no evidence of ore production and concentrations in soil are greater than 530 mg/kg for lead and/or 100 mg/kg for arsenic, the site will be retained in the Upper Basin Preferred Alternative; and (2) if there is no evidence of ore production and concentrations in soil are less than 530 mg/kg for lead and/or 100 mg/kg for arsenic, the site will potentially be removed from the Upper Basin Preferred Alternative.

[b] Bold values indicate concentrations exceeding the decision criteria.

BLM = Bureau of Land Management

mm = millimeter(s); mg/kg = milligram(s) per kilogram

SFCDR = South Fork of the Coeur d'Alene River

TABLE 5

Summary of 2011 Focused Characterization Sampling and Decision Criteria Results

Upper Coeur d'Alene Basin 2011 Focused Characterization Sampling, Bunker Hill Superfund Site

	Number of Sites	Number of Sites Removed from Upper Basin Preferred Alternative	Number of Sites Retained in Upper Basin Preferred Alternative
Candidate Sites Considered for 2011 Focused Characterization Sampling	83	--	--
Sites Screened (Removed from Focused Characterization Sampling) Based on Historical Review	9	--	9
Sites Included in 2011 Focused Characterization Sampling Program	74	--	--
Sites Sampled[a]	51[a]	--	--
Sites Not Sampled[b]	20[b]	--	20
Sites with No Evidence of Mining	3	3	--
Sites with No Decision Criteria Exceedences	39	39	--
Sites with Decision Criteria Exceedences	12	--	12
Total	--	42	41

Notes:

[a] The total number of sites shown is only for sites included in the Upper Coeur d'Alene Basin Focused Characterization Sampling Quality Assurance Project Plan (QAPP) (CH2M HILL, 2011). Two sites were sampled that were not targeted in that QAPP.

[b] Sites were not sampled due to lack of private property access, no direct physical access, and schedule limitations.

-- = Not applicable