

**Soil Sampling Results from Areas West and South  
of the  
North Campus of  
Montana Tech of The University of Montana  
Butte, Montana  
by  
Montana Bureau of Mines and Geology  
March 2009**



## **Summary**

A total of ten soil samples were collected and analyzed for metals content from two areas adjacent to the Montana Tech North Campus. These areas comprise a proposed land transfer between BP/ARCO and Montana Tech; a previous land transfer look place involving land north of this area. The purpose of the sampling was to assess the potential liability of mine wastes remaining from historic mining activities, since this area is part of the U.S. Environmental Protection Agency (EPA) Westside Soils Operable Unit Superfund Site.

Samples from most of the land under consideration showed no exceedences of any metals standard. All of the exceedences were confined to one waste pile located in the northeast portion of lands under consideration. Here, two samples exceeded all the lead standards for exposure. This is the only observed mine waste pile within the areas of the proposed land transfer and comprises a very small portion of the involved land. One sample (0-10" depth) from the south area was at the maximum level for arsenic in a residential setting; however, the concentration was well below the standards for commercial and recreational purposes and does not pose a threat at this location. The shallow (0-1") sample at this location was below the residential standard.

To preclude future environmental liability to MT Tech, the area with the waste pile that exceeds lead standards could be back filled and covered with clean material similar to the procedures used on the waste piles to the north, that were previously transferred.

If this limited area of contaminated material was covered, there would be no potential environmental liability associated with the land transfer for MT Tech and the State of Montana as the remaining arsenic and lead concentrations are well below the EPA guidelines.

## **Introduction**

A large portion of the area west of the Montana Tech campus is owned by the British Petroleum/Atlantic Richfield Company (BP/ARCO), which is interested in transferring ownership to other parties. A previous land transfer involving land

north of Bluebird Trail occurred several years ago following a similar environmental analysis. Montana Tech is interested in two parcels that abut the campus and are shown on the attached map (fig. 1). The larger parcel of land is south of Bluebird Trail and is bounded by Montana Tech property on the east and the Orphan Boy Mine waste dumps on the west; the smaller parcel is bounded by the Historic BA&P Walking Trail on the east and north and Museum Way Road on the west and south.

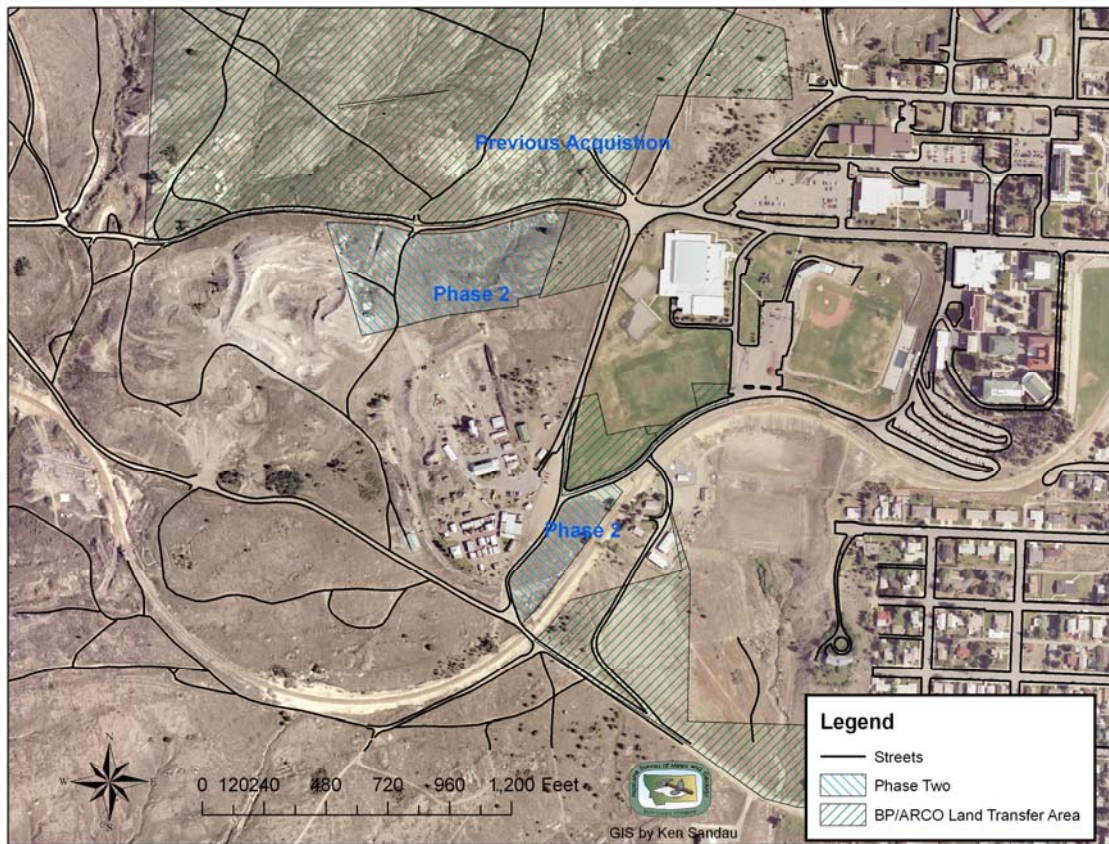


Figure 1. Location map showing the two areas of potential land transfer between BP/ARCO and MT Tech.

The entire area lies within the Butte Area/Silver Bow Creek Superfund Site and is part of the Westside Soils Operable Unit. This area is considered a Superfund site due to the presence of mine wastes from historic mining activities. Notable mines that are adjacent to and within the study area are the Orphan Girl and Orphan Boy. The Orphan Boy mine shaft is included in the land transfer;

however, a concrete bulkhead covers the shaft and the area surrounding the shaft has been fenced to limit access. The shaft and fencing are maintained for monitoring purposes under the 2002 Butte Mine Flooding Operable Unit Consent Decree that included BP/ARCO, EPA and The Montana Department of Environmental Quality (DEQ). The south (smaller) parcel of land lies adjacent to the historic BA&P Railroad and right-away. This property has been reclaimed and converted to a Walking Trail as part of the on-going Butte Priority Soils Operable Unit Superfund activities.

To assess the potential environmental liability that might exist with these areas, the Montana Bureau of Mines and Geology (MBMG) conducted detailed soil sampling of waste piles and barren patches of ground in the area of the proposed land transfer. The area encompassing the land transfer, while being near several historic mines and near areas of extensive prospecting, shows very little evidence of mining-related activity. Prior to beginning the soil sampling program on the north side in 2005, a letter was sent to the EPA and DEQ with a description of the sampling plan. The sampling plan followed the procedures used during the Butte Priority Soils Operable Unit (BPSOU) investigations. (Copies of correspondence are included in Appendix 1). EPA and MDEQ provided a letter approving the sampling plan. The 2008 sampling of these additional areas followed the same sampling protocol.

### **Description of Sampling Activities**

The sampling plan followed protocol established for the BPSOU investigations. The EPA protocol collects samples only from the 0 to 1-inch depth interval; this sampling project included a composite sample collected from 0 to 12 inches to better characterize the waste pile at depth. However, due to the presence of bedrock close to ground surface a number of the deeper samples could not be dug the full 12-inches; therefore sample depths varied from 4-inches to 12-inches below ground surface. Each sample area was assigned a unique field number, i.e. SS-1, prior to sampling.

Samples from each sample site were collected using the EPA 5-point “X” configuration, where samples are collected at the ends and crossing point of the “X”. An “X”, which measured at least three feet by three feet (3' x 3') and represented a large area of the sample area, was made on ground surface. Once the five holes were dug, samples of material were scraped off the inside of the hole from the two respective sample intervals using a stainless steel spoon and placed into separate stainless steel bowls. The material was then thoroughly mixed (composited) and placed in closable Ziploc plastic bags, properly labeled with the field number, sample interval and sample date. Coordinates for each sample site were recorded using a hand-held GPS unit; site locations are shown on figures 2 and 3.

Sampling equipment was cleaned using a stiff-bristle, plastic brush and wiped with clean paper towels between each sample. All sampling equipment was thoroughly washed at the start of each day also.

Samples were delivered to the MBMG lab where they were dried, digested, and analyzed by ICP and ICP/MS following EPA Method 200.7 for arsenic, cadmium, copper, iron, lead, and zinc.

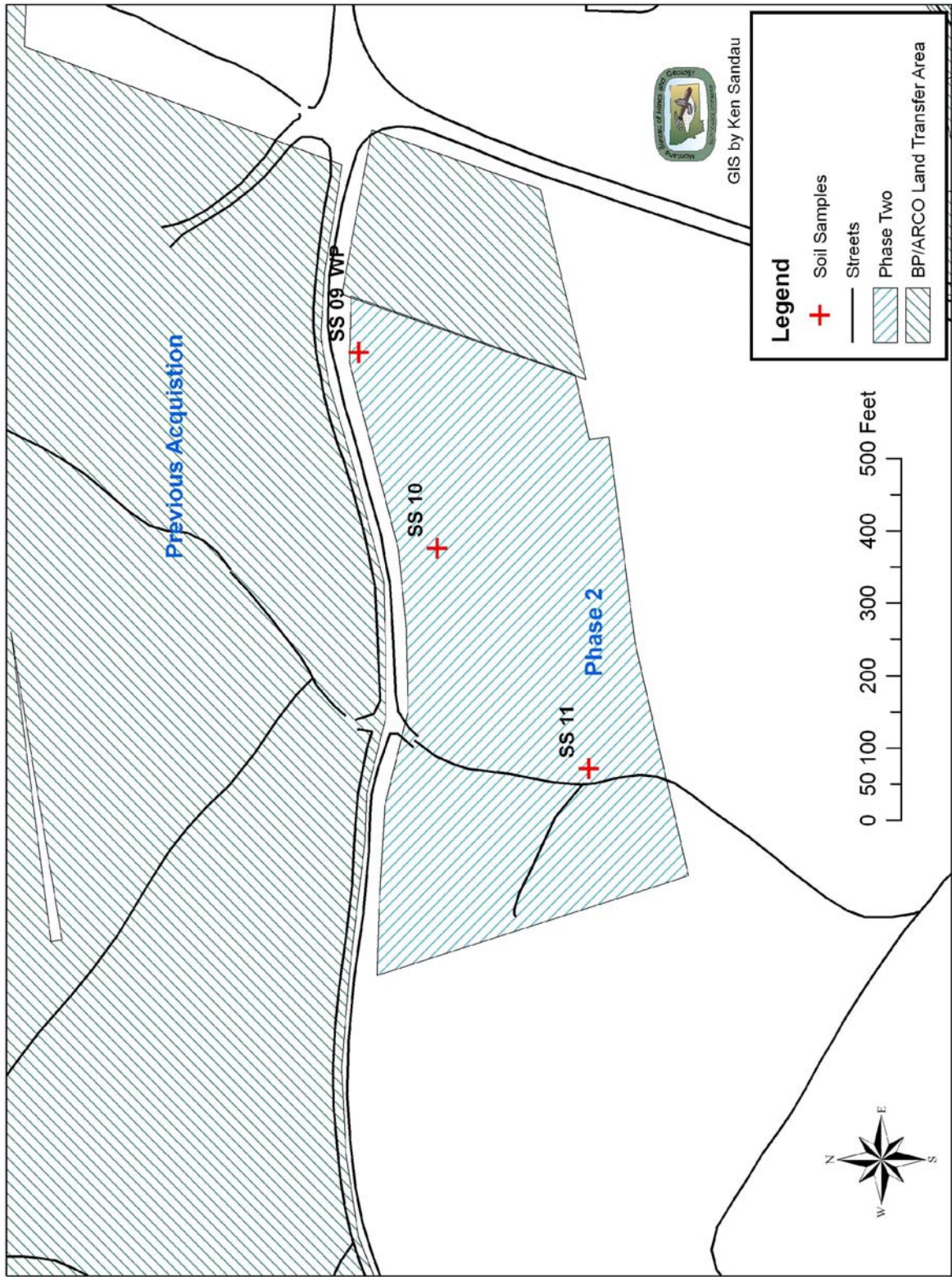


Figure 2. Soil sample locations for the north parcel of land.

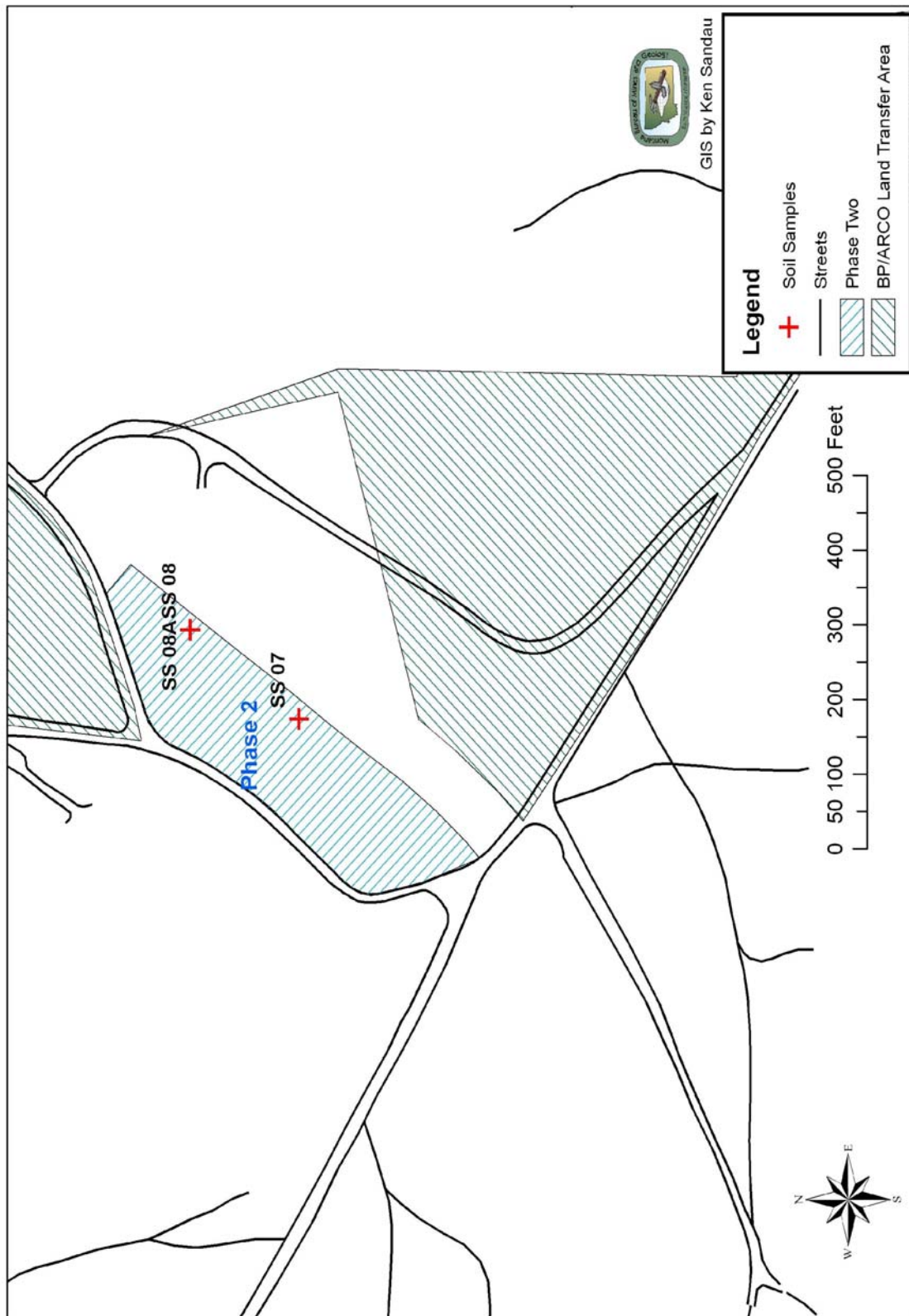


Figure 3. Soil sample locations for the south parcel of land.

## **Sample Results**

A total of ten samples from five different locations were collected and analyzed. In addition two blank samples were collected. Results from all samples are contained in Appendix 2.

Only two of the six analytes, arsenic and lead, have well established exposure standards. These standards are those established by EPA for the BPSOU. While only two analytes have exposure standards, the other four analytes are used to assess overall environmental conditions and potential impacts to vegetation and from runoff on surface water bodies. Table 1 shows those standards and the number of samples exceeding the standards.

**Table 1. Arsenic and lead soil standards and number of exceedences.**

	<b>Category</b>	<b>Standard (ppm)</b>	<b>Number Exceedences</b>	<b>Number Sites</b>
<b>Arsenic</b>	Residential	250	0	0
	Commercial	500	0	0
	Recreational	1000	0	0
<b>Lead</b>	Residential	1200	2	1
	Commercial/Industrial/ Recreational	2300	2	1

Based upon the information contained in Table 1, lead is the only analyte that exceeds the EPA-recommended standards. One arsenic sample was at the residential standard maximum; however, it was well below the standards for commercial and recreational properties that would apply to this area.

Table 2 summarizes sample results by sample area/type, i.e. waste pile, blank, etc. The lead exceedence occurred in samples collected from the one waste pile located on the northeast edge of the large parcel of land.



**Table 2. Sample statistics by source area/sample type.**

		<b>As</b>	<b>Cd</b>	<b>Cu</b>	<b>Fe</b>	<b>Pb</b>	<b>Zn</b>
<b>Sample blanks</b>	Mean	18.9	0.45	69.4	9,603	29.0	105
	Min	18.8	0.44	64.8	9,576	28.5	104
	Max	19.0	0.47	74.0	9,630	30.0	106
<b>Soil samples</b>	Mean	59	1.38	130	13,857	151	542
	Min	6	0.33	18	10,668	23	88
	Max	250	2.96	432	19,170	350	1,626
<b>Waste piles</b>	Mean	109	1.34	60	12,848	<b>3,349</b>	224
	Min	82	0.73	56	10,545	<b>2,760</b>	213
	Max	136	1.95	64	15,150	<b>3,938</b>	235

All concentrations are in mg/kg or parts per million (ppm).

The average lead concentration in the waste pile exceeds the highest (2,300 ppm) standard for human exposure, however, if the samples from the one waste area with an exceedence are removed, the average concentration from all soil samples is 151 ppm with a maximum concentration of 350 ppm. These levels are well below the lead standard established for residential areas (1200).

### **Conclusion**

Soil samples were collected and analyzed for selected trace metals from two areas adjacent to the MT Tech-North Campus that are part of a potential land transfer between BP/ARCO and MT Tech. No arsenic exceedences were found in samples from the two areas; however, lead exceedences were noted in two samples from the large land parcel. The source of the exceedence is waste material associated with a relatively small waste pile adjacent to a small exploration hole. While both parcels of land are near historic mining sites and within the BPS-Westside Soils Operable Unit, only one waste pile was found on these properties.

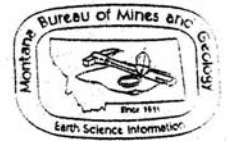
The one waste pile can be used to fill the adjacent excavation, then covered with an 18-inch to 24-inch layer of clean material to complete

reclamation. The arsenic and lead concentrations in the remaining areas are below the EPA limit for residential areas while the proposed usage of the land in the exchange areas would be a combination of commercial and recreational which have even higher concentration limits. Therefore, there should be no environmental liability from metals contamination in the areas of the proposed land transfer.

## **Appendix 1**

### **Correspondence with EPA and DEQ**

**MontanaTech**  
MONTANA BUREAU OF MINES  
AND GEOLOGY



COPY

December 6, 2005

Ms. Sara Sparks  
USEPA  
155 W. Park  
Butte, MT 59701

Mr. Joe Griffin  
MDEQ  
PO Box 200901  
Helena, MT 59620-0901

Dear Sara and Joe:

I would like to thank you for your time spent discussing the proposed soil sampling on lands west of Montana Tech of the UM (MT Tech) campus. Herein details the reasons behind this sampling and provides a brief discussion of the proposed sampling plan for your review and comment.

British Petroleum/ Atlantic Richfield Co. (BP/ARCO) and MT Tech have been discussing the transfer of a portion of BP/ARCO's property to MT Tech. The property is mainly northwest of the MT Tech campus and is part of the Westside Soils Operable Unit. The areas of interest to MT Tech are shown on the enclosed map.

Before requesting approval for this transfer from the Montana University System Board of Regents, MT Tech must identify any potential liabilities on this property. Our goal is to identify any sites on this property that do not meet the appropriate standards, and would thus result in a liability to MT Tech or the University System. MT Tech and the Montana Bureau of Mines and Geology (a department of MT Tech) are proposing the sampling and analysis of soils and waste dump material in this area following EPA protocols. There are approximately 30 small waste piles adjacent to old mine prospects (glory holes) and we propose to sample each of the piles following the EPA - 5 point "X" configuration. Samples from the surface to 1-inch depth intervals will be collected following the Clark Fork River soil sampling Standard Operating Procedures. (This interval is the EPA recommended zone for determining human health

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406-496-4180 • Fax: 406-496-4451

exposure.) In addition, we will collect composite samples from the 0 to 12-inch depth interval to further characterize these wastes should they be disturbed or moved in the future. Two or more samples will be collected from the larger waste piles. Random samples will be taken of the undisturbed native soil at five or six locations following the same sampling protocols. Duplicate and blank samples will also be collected and analyzed from this area. Samples will be analyzed by EPA Method 200.7 for arsenic, cadmium, copper, lead, and zinc.

There are two other small areas to the south that we will also be sampling at the 0 to 1-inch depth interval (see the attached map). However, at these two sites we are planning to collect drill (core) samples to a depth of 10-ft to characterize any fill material in the area. Composite samples will be collected and analyzed for the depth intervals of 0-1 ft, 1-3 ft, and 4-10 ft.

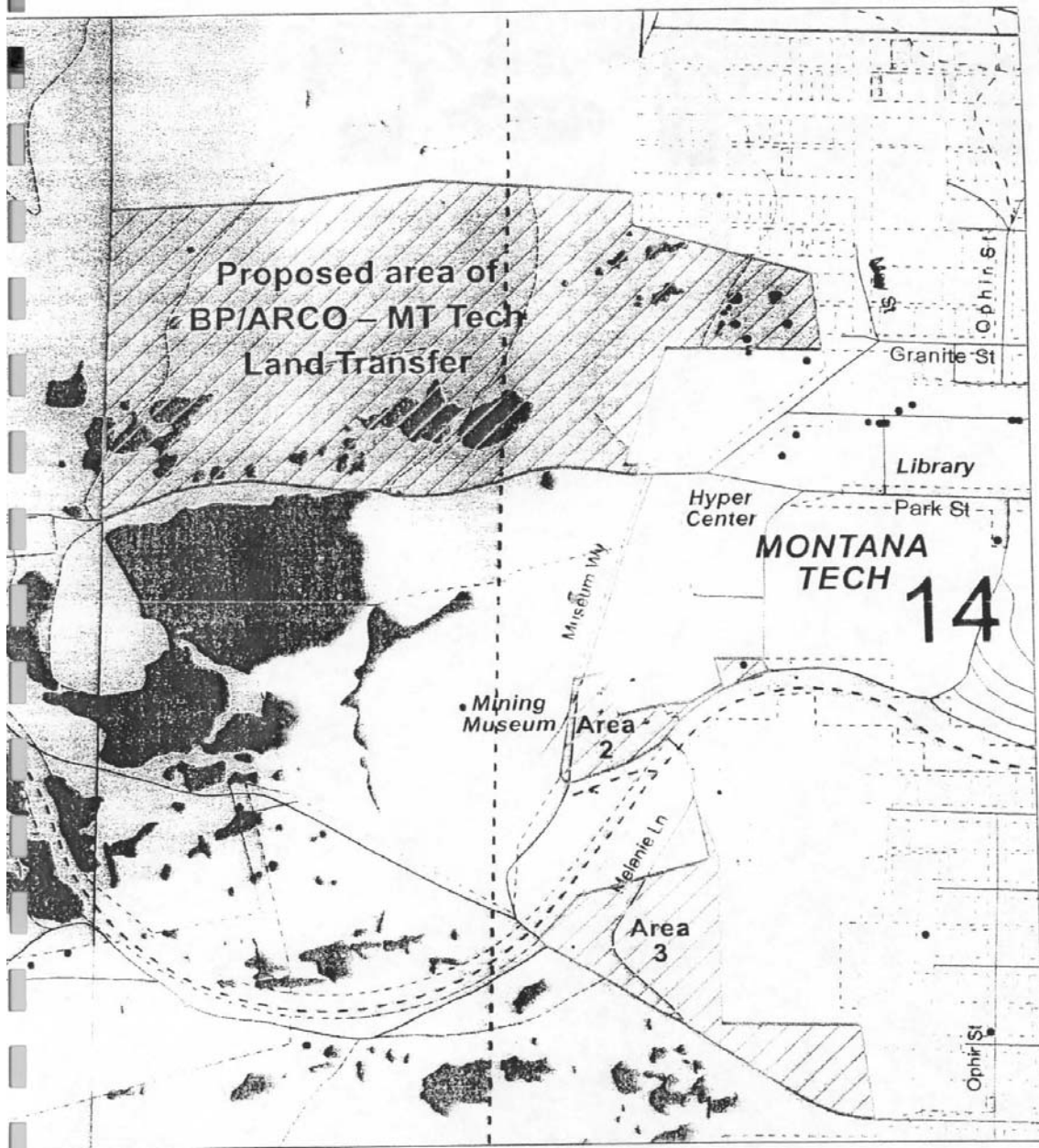
We want to ensure the sampling is sufficient to preclude any need for additional future characterization. However, we realize that if waste piles are disturbed, additional sampling may be necessary in those areas. I would appreciate any suggestions, comments, or concerns EPA and DEQ might have concerning the proposed work. Any improvements that would help minimize future legal conflicts would be welcome. Feel free to contact me if you would like to discuss this work in more detail. I appreciate your time and effort reviewing this brief description and look forward to your response.

Sincerely,



Ted Duaine  
Hydrogeologist

TD:pd  
Enclosures  
xc: Ed Deal, MBMG  
Frank Gilmore, MT Tech



Map showing the three areas of the proposed BP/ARCO-MT Tech land transfer.

██████████  
██████████ Duaine, Ted

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██████████ From: Sparks.Sara@epamail.epa.gov

██████████ Sent: Wednesday, December 14, 2005 8:08 AM

██████████ To: Duaine, Ted

██████████ Subject: Re:

██████████ I: Joe and I went out and looked at the area. doesn't seem to have much mine waste--just as you had told me. I will get  
██████████ letter. The sampling you propose is exactly what we use in the BPSOU. Thanks Sara

██████████ Sara Weinstock Sparks  
██████████ Remedial Project Manager

██████████ EPA

██████████ 100 W. Granite Street

██████████ Helena, MT 59701

██████████ Phone: (406) 782-7415

██████████ Fax: (406) 782-3838

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 8, MONTANA OFFICE  
FEDERAL BUILDING, 10 W. 15<sup>TH</sup> STREET, SUITE 3200  
HELENA, MONTANA 59626

Ref: 8MO

December 16, 2005

Mr. Ted Duaimé  
Montana Bureau of Mines and Geology  
1300 West Park Street  
Butte, MT 59701-8997


Re: Sampling Plan for land West of Montana Tech

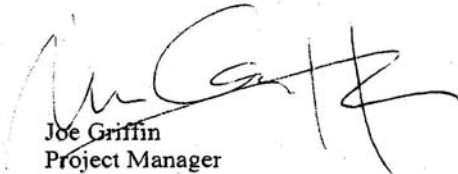
Dear Ted:

The U.S. Environmental Protection Agency and the Montana Department of Environmental Quality has reviewed your proposed sampling plan for the property west of Montana Tech. The sampling plan you have proposed is exactly what is used for the BPSOU. The Agencies approve your proposed sampling plan.

If you have any questions or concerns, please call me at (406) 782-7415 or Joe Griffin at (406) 841-5042.

Sincerely,

  
Sara Weinstock Sparks  
Remedial Project Manager

  
Joe Griffin  
Project Manager



## **Appendix 2**

### **Soil Sample Results**

**Appendix 2-1. Results of all soil samples.**

Montana Tech Soil Sampling  
BP/ARCO Land  
Exchange

Site ID	Sample Interval (in)	Description	Arsenic As (mg/kg) (250, 500, 1,000)	Cadmium Cd (mg/kg)	Copper Cu (mg/kg)	Iron Fe (mg/kg)	Lead Pb (mg/kg) (1,200, 2,300)	Zinc Zn (mg/kg)
			<b>EPA Standards</b>					
SS-07a	0-1	Coarse sand	135	2.82	394	14,622	350	1,211
SS-07b	0-10	0-3" coarse sand; 3-10" weathered granite, oxidized	250	2.96	432	19,170	333	1,626
SS-08a	0-1	Coarse sand	34	1.08	84	13,718	51	161
SS-08b	0-8	0-2" coarse sand; 2-8" coarse weathered granite, hard at 5"	13	0.57	35	10,668	64	88
SS-09a	0-1	Broken-yellow gray rock-waste dump	136	0.73	64	15,150	<b>2,760</b>	213
SS-09b	0-12	0-3" broken weathered rock; 3-12" broken-weathered rock, some oxidation	82	1.95	56	10,545	<b>3,938</b>	235
SS-10a	0-1	Coarse sand, weathered granite	9	0.70	25	12,487	43	200
SS-10b	0-4	0-2" coarse weathered granite; 2-4" semi-hard granite	6	0.33	18	13,738	23	137
SS-11a	0-1	Brown coarse sand, some clay, weathered granite	17	1.80	25	11,477	262	597
SS-11b	0-6	Weathered granite, coarse sand, very hard at 6"	10	0.75	27	14,977	84	315
Mean			69	1.37	116	13,655	791	478
Maximum			250	2.96	432	19,170	<b>3,938</b>	1,626
Minimum			6	0.33	18	10,545	23	88
Number			10	10	10	10	10	10
<b>Number of Exceedences</b>			<b>0</b>					<b>2</b>

**Appendix 2-2. Results of soil samples without exceedences.**

Montana Tech Soil Sampling  
BP/ARCO Land Exchange

Site ID	Sample Interval (in)	Description	Arsenic As (mg/kg) (250, 500, 1,000)	Cadmium Cd (mg/kg)	Copper Cu (mg/kg)	Iron Fe (mg/kg)	Lead Pb (mg/kg) (1,200, 2,300)	Zinc Zn (mg/kg)
		<b>EPA Standards</b>						
SS-07a	0-1	Coarse sand	135	2.82	394	14,622	350	1,211
SS-07b	0-10	0-3" coarse sand; 3-10" weathered granite, oxidized	250	2.96	432	19,170	333	1,626
SS-08a	0-1	Coarse sand	34	1.08	84	13,718	51	161
SS-08b	0-8	0-2" coarse sand; 2-8" coarse weathered granite, hard at 5"	13	0.57	35	10,668	64	88
SS-10a	0-1	Coarse sand, weathered granite	9	0.70	25	12,487	43	200
SS-10b	0-4	0-2" coarse weathered granite; 2-4" semi-hard granite	6	0.33	18	13,738	23	137
SS-11a	0-1	Brown coarse sand, some clay, weathered granite	17	1.80	25	11,477	262	597
SS-11b	0-6	Weathered granite, coarse sand, very hard at 6"	10	0.75	27	14,977	84	315
Mean			59	1.38	130	13,857	151	542
Maximum			250	2.96	432	19,170	350	1,626
Minimum			6	0.33	18	10,668	23	88
Number			8	8	8	8	8	8
<b>Number of Exceedences</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Appendix 2-3. Results of soil samples with exceedences.**

Montana Tech Soil Sampling  
 BP/ARCO Land  
 Exchange

Site ID	Sample Interval (in)	Description	Arsenic As (mg/kg) (250, 500, 1,000)	Cadmium Cd (mg/kg)	Copper Cu (mg/kg)	Iron Fe (mg/kg)	Lead Pb (mg/kg) (1,200, 2,300)	Zinc Zn (mg/kg)
			<b>EPA Standards</b>					
SS-09a	0-1	Broken-yellow gray rock-waste dump	136	0.73	64	15,150	<b>2,760</b>	213
SS-09b	0-12	0-3" broken weathered rock; 3-12" broken-weathered rock, some oxidation	82	1.95	56	10,545	<b>3,938</b>	235
Mean			109	1.34	60	12,848	3,349	224
Maximum			136	1.95	64	15,150	<b>3,938</b>	235
Minimum			82	0.73	56	10,545	2,760	213
Number			2	2	2	2	2	2
<b>Exceedences</b>			<b>0</b>				<b>2</b>	<b>2</b>

**Appendix 2-4. Results of blank samples.**

Montana Tech Soil Sampling  
Kebe/MT Tech Land Exchange

Site ID	Sample Interval (in)	Description	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg) (1200, 2300)	Zn (mg/kg)
<b>EPA Standards (250,500,1000)</b>								
SS-4a	0-1	Blank, MT Tech planters	19	0.44	74	9,630	30	104
SS-4b	0-6	Blank, MT Tech planters	19	0.47	65	9,576	29	106
Mean*			19	0.45	69	9,603	29	105
Maximum*			19	0.47	74	9,630	30	106
Minimum*			19	0.44	65	9,576	29	104
Number*			2	2	2	2	2	2
<b>Number of Exceedences</b>			<b>0</b>				<b>0</b>	