

# Health Consultation

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Exposure Investigation

**Biological Monitoring for Exposure to Lead and Arsenic**

**Superior, Mineral County, Montana**

Cost Recovery Number: 80ER

MARCH 31, 2011

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Agency for Toxic Substances and Disease Registry  
Division of Health Assessment and Consultation  
Atlanta, Georgia 30333

## **Health Consultation: A Note of Explanation**

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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ATSDR/DHAC/EISAB

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## **A. Abbreviations and Acronyms**

ATSDR	Agency for Toxic Substances and Disease Registry
BLL	Blood Lead Level
DHAC	Division of Health Assessment and Consultation
DMA	Dimethylarsonic Acid
DRO	Division of Regional Operations
EI	Exposure Investigation
EISAB	Exposure Investigations and Site Assessment Branch
EPA	Environmental Protection Agency
ETAAS	Electrothermal Atomic Absorption Spectrometry
HPCIB	Health Promotion and Community Involvement Branch
IMM	Flat Creek Iron Mountain Mine and Mill
LOD	Limit of Detection
MCEHP	Mineral County Environmental Health and Planning
MCHD	Mineral County Health Department
MCL	Maximum Contaminant Level
MDEQ	Montana Department of Environmental Quality
MDL	Method Detection Limit
MDPHHSL	Montana Department of Public Health and Human Services Laboratory
MMA	Monomethylarsonic Acid
NCEH	National Center for Environmental Health
NHANES	National Health and Nutrition Examination Survey
NPL	National Priorities List
ppb	parts per billion
ppm	parts per million
PWS	Public Water Supply

## **B. Executive Summary**

The community of Superior, Montana is located in close proximity to the Flat Creek Iron Mountain Mine and Mill (IMM) site. In the past, waste tailings from the IMM site were used as fill material in Superior, resulting in high levels of metals in town soils. The Agency for Toxic Substances and Disease Registry (ATSDR) conducted this Exposure Investigation (EI) to assess the exposure of residents of this community to lead and arsenic that were found in soil samples of residences and public spaces following soil evaluation by the U. S. Environmental Protection Agency (EPA).

With the help of the Mineral County Health Department (MCHD) and community members, we recruited 63 residents who lived in the community of Superior, MT. Although all residents of Superior, MT were eligible to participate, our recruitment efforts focused on residents who resided on property found to have soil samples with a lead level of more than 400 parts per million (ppm). The EI population consisted of 33 adults and 30 children under the age of 18 years of age.

ATSDR, working with the MCHD, arranged for use of the Superior High School multipurpose room as a central location for EI participants to provide blood samples for lead and urine samples for arsenic. Tap water samples were collected from five homes for evaluation for lead. We also administered a questionnaire to identify other potential sources of exposure to lead and arsenic.

The 95<sup>th</sup> percentile of a national reference population (1,2) was used as the reference range for the blood lead and urinary arsenic samples. Therefore, it was expected that about 5 percent of the samples could be above the reference range, even if no unusual exposures were occurring. However, no participant had a lead or arsenic sample that was above the 95<sup>th</sup> percentile of a national reference population. A national reference range for urinary arsenic was not available for participants below the age of six. Fifteen participants below the age of six years of age did not undergo urine testing for arsenic.

The concentration of lead in all home tap water samples was below EPA's action level of 15 micrograms/liter ( $\mu\text{g/L}$ ) for lead in drinking water (3).

ATSDR found no evidence of unusual exposures to the lead and arsenic found in soil on residential and public property in Superior, MT for EI participants during the testing period. The levels of lead and arsenic detected in the EI participants blood and urine samples were below levels of health concern for exposure for all participants. This EI was conducted during the summer (July 2010) when outdoor activity and the potential for exposure to soils are expected to be at their highest. EPA is moving forward with plans for remediation of soil on residential and public properties found to have highly elevated levels of lead and arsenic to further lessen the likelihood that residents of Superior, MT will be exposed to soil contaminated with high levels of lead and arsenic.

## C. Introduction

The town of Superior, MT (population of 893 in the 2000 census) is located in close proximity to the IMM site. The IMM site was discovered in 1888 and produced silver, gold, lead, copper, and zinc ore; it remained in operation until 1954. A large waste rock pile and some waste tailings deposits (containing detectable levels of arsenic, antimony, lead, and manganese) still exist on the mine property, although a majority of the waste tailings have been washed downstream onto the Flat Creek floodplain. In the past, waste tailings from the IMM site were used as fill material in Superior, resulting in high levels of metals in town soils.

In January 2002, the Montana Department of Environmental Quality (MDEQ) requested that the EPA evaluate the town of Superior for a possible removal action based on data that reported high levels of lead and arsenic in town soils. In June 2002, EPA conducted additional surface and subsurface soil sampling and found multiple areas of Superior with soil containing elevated levels of arsenic and lead. For lead, 10 of 27 residential properties in Superior were found to have soil lead levels present above 400 parts per million (ppm) with a maximum concentration of 16,700 ppm. For arsenic, 11 of 29 residential properties were found to have arsenic concentrations greater than 20 ppm with a maximum concentration of 2,620 ppm. In August 2002, EPA began a time-critical removal action in Superior. Contaminated soils and waste tailings located in other areas, including rights-of-way and residential properties, were included in the EPA removal action if the average surface soil concentration exceeded 400 ppm arsenic and/or 3,000 ppm lead. Overall, EPA removed approximately 6,500 cubic yards of contaminated tailings and soil from town locations (4).

Also in 2002, Mineral County Environmental Health and Planning (MCEHP) collected blood lead and urinary arsenic samples from individuals living in Superior. In February 2002, 66 Superior residents were tested for lead exposure. All blood lead concentrations were less than 10  $\mu\text{g}/\text{dL}$ . Among the 66 people tested were eight children below seven years of age with a range of blood lead levels (BLL) between 1 – 2.6  $\mu\text{g}/\text{dL}$ . In addition, seventeen Superior residents provided a urine sample to test for urinary arsenic. No urine samples were taken from children younger than six years of age. All 17 residents had urinary arsenic levels below the detection limit of 5  $\mu\text{g}/\text{L}$  (4). Based on the available sampling data, results show that these adult residents of Superior showed no evidence of unusual exposure to arsenic during the 2–3 days prior to their urine collection.

However, these blood and urinary samples were collected in February and may not represent peak exposure levels to soil, sediment and waste tailings, which are more likely to occur in the summer when outdoor activities occur and the ground is not frozen or covered by snow.

In February 2004, ATSDR received a petition for a public health evaluation of heavy metal contamination in soil and water in Superior, Montana. Residents expressed concern regarding exposures to waste tailings from the IMM site. Waste tailings from this mine site have washed down along the banks and floodplain of Flat Creek. Additionally, some waste tailings were used as fill material in the town. To address community concerns, ATSDR evaluated available data to determine whether residents have had harmful health effects from exposures to heavy metal contamination in soil and water.

Between 2004 and 2009, ATSDR met with the petitioner to discuss the site, conducted site visits and reviewed data collected from several on-going sampling events performed by the EPA and others. ATSDR staff also met with county staff and toured the site and possible contamination source areas (visible waste tailings along Flat Creek and on the mine property).

In April 2009, EPA listed the Flat Creek IMM site on its National Priorities List (NPL), and the first phase of residential soil sampling occurred in the summer of 2009. This repeat testing by EPA identified soil at 67 properties in Superior, MT greater than 400 ppm of lead and 19 of those homes with soil lead levels greater than 2,999 ppm with the maximum concentration found to be 12,576 ppm. In addition, soil arsenic levels were also noted to be greater than 20 ppm (maximum of 2841 ppm) in a number of the properties with elevated lead levels(5).

In July 2009, ATSDR joined EPA staff at a public meeting held in Superior where ATSDR staff discussed the findings of a public health assessment that was written based on this evaluation. In this Public Health Assessment, which was published in January 2010 (4), ATSDR concluded that coming into frequent contact with heavy metals in the waste tailings on the IMM site, the Flat Creek floodplain, and the town of Superior could harm people's health. Therefore, frequent, contact-intense activities with the waste tailings may result in exposures that are a public health hazard.

In November 2009, the MCHD requested ATSDR assistance to conduct an exposure investigation (EI) to evaluate the potential for exposure of Superior, MT residents to lead and arsenic. This community concern resulted from the presence of continued high levels of lead and arsenic in the town soil. In addition, the previous blood and urinary results obtained in 2002 might not have represented peak exposure levels to soil, sediment and waste tailings, such as those that might occur in the summer when outdoor activities occur. Finally, only a limited number of children, who are at a higher level of risk of exposure to soil contamination, were included in previous testing.

The potential for an exposure pathway for lead from the local water supply was also considered. Since the early 1900s, the majority of town residents have been connected to the public water supply (PWS). Previously, the PWS source for the town of Superior was a spring adjacent to Flat Creek. However, the Mountain Water Company (former PWS owner) discontinued use of Flat Creek Spring in 1997 when antimony was detected at concentrations above the EPA's maximum contaminant level (MCL). Currently, the spring is not in use, but it is maintained as an emergency drinking water source.

Ownership of the PWS was transferred from the Mountain Water Company to the town of Superior in October 2000. There are three production wells in the current system. All three wells are located within the city limits of the town of Superior and each has its own treatment plant. The town of Superior tests these wells for water quality in accordance with federal standards. 10 of 13 past samples of treated water from the PWS contained detectable lead levels but all were less than EPA's MCL of 15 ppb. The current PWS has a total of 430 service connections (6).

Information obtained from the Mineral County sanitarian (*see Appendix A*) indicate that the town of Superior PWS applied for and received a full waiver for reduced monitoring for lead and

copper from the MDEQ based on low levels in past sample testing and the non corrosive nature of the current water supply in December 2005. It is not clear from this documentation whether the last testing performed in August 2004 was performed at the water treatment plant or at home spigots in the town. The next testing for lead is scheduled for the 2011-2013 period.

## **D. Purpose**

ATSDR conducted biological monitoring for exposure to lead and arsenic in residents of Superior, MT, with a focus on pregnant women and children between the ages of 9 months and 11 years of age. In addition up to 5 participants in the EI with children under the age of 11 were asked to provide a home tap water sample for lead testing. Participation in the home tap water sampling was on a voluntary basis and did not affect the ability of the participant to obtain blood lead and urinary arsenic testing.

Sampling of home tap water (for lead), blood (for lead) and urine (for arsenic) occurred during the week of July 12<sup>th</sup>, 2010 when outdoor activities were near their peak. This EI consisted of two parts. First, a community education program was presented to residents and health professionals to advise them of the potential risk of lead and arsenic in the community and to encourage targeted residents to participate in the testing program. Based on age, participants provided written consent, assent and parental permission. Biological and environmental monitoring were conducted using validated, state-of-the-science analytical methodologies. The results of this investigation provided the participants with accurate information on their current level of exposure to lead and arsenic. In addition to biological and environmental sampling, EI participants (or their parent/guardian) answered a brief questionnaire to assist ATSDR in the interpretation of the results of biological sampling.

## **E. Investigators and Collaborators**

The ATSDR/Division of Health Assessment and Consultation (DHAC)/Exposure Investigations and Site Assessment Branch (EISAB) was the lead agency for this EI.

### *EISAB:*

- (1) Worked with the MCHD and the community to recruit participants for the EI and provide community health education for lead and arsenic exposure.
- (2) Procured supplies for biological and environmental monitoring
- (3) Contracted for local phlebotomists to draw blood samples
- (4) Administered consent/assent and parental permission forms and questionnaires
- (5) Collected biological/environmental samples and shipped them to the laboratory for analysis
- (6) Evaluated the analytical test results

(7) Notified the participants of their individual test results

(8) Coordinated with EPA to conduct the EI at a time that will minimize impact on the EI while also minimizing disruption of the planned remediation and additional soil sampling also planned for the summer time period when the EI was conducted.

*ATSDR/Division of Regional Operations (DRO)/Region 8/Montana Office:*

- (1) Worked in close cooperation with EISAB to complete the tasks assigned to it to include providing input on development and implementation of the EI and the final EI report.
- (2) Served as the primary liaison between ATSDR and MCHD to facilitate coordination with local partners and the community.

*MCHD:*

- (1) served as the lead local agency for the EI
- (2) Led the effort in the community to recruit participants for the EI
- (3) Served as the primary resource for education to the local community on the risks of exposure to elevated lead and arsenic concentrations.
- (4) Assisted in conducting the biological and environmental sampling conducted in Superior, MT during the week of July 12<sup>th</sup>, 2010.

*ATSDR/DHAC/Health Promotion and Community Involvement Branch (HPCIB):*

- (1) Assisted the MCHD with developing resource materials for the community education program and providing health education to the community as requested by MCHD
- (2) Worked with EISAB and the MCHD to develop recruitment materials

*National Center for Environmental Health (NCEH) Laboratory:*

- (1) Provided supplies for collecting blood and urine samples
- (2) Analyzed urine samples for the chemical of concern, arsenic, measured the urine creatinine level and conducted speciated arsenic analysis for participants with an elevated level of arsenic.
- (3) Provided results from the urinary arsenic samples to ATSDR.

- (4) Reviewed and confirmed the results of blood samples for the chemical of concern, lead, initially analyzed by the Montana Department of Public Health and Human Services Laboratory (MDPHHSL).

*MDPHHSL:*

- (1) Provided supplies for collecting home tap water samples for lead.
- (2) Analyzed blood samples for the chemical of concern, lead.
- (3) Analyzed home tap water samples for the chemical of concern, lead.
- (4) Provided the individual water lead and blood lead results to ATSDR.

The Superior, MT health community, in cooperation with MCHD:

- (1) Assisted ATSDR in identifying and recruiting participants for the EI.

## **F. Methods**

### **1. Criteria for Participation**

ATSDR worked with the MCHD to recruit residents with the highest potential exposures to lead and arsenic, especially those who live in residences identified by the EPA as having a high level of soil contamination. Exposure to lead and arsenic results primarily from waste tailings from the mine used as surface soil fill on public and residential properties in the town of Superior, MT. Participation in this EI was initially limited to pregnant woman and children but because available appointments did not fill, participation was later opened to adult participants. Children who currently live in or near the town of Superior, MT, aged 9 months to 5 years of age were tested for blood lead; children 6 - 11 years of age and all older participants were tested for lead and arsenic. Participants who made an advanced appointment and walk-in participants were seen and enrolled in this EI.

The decision to include older participants was made two weeks prior to the planned EI because a number of local residents requested testing for older residents of the community and because available appointment spaces had not been filled by younger participants by that time.

### **2. Recruiting Participants**

ATSDR staff worked with the MCHD and the community to identify and offer testing to all families in Superior, MT with children meeting the recommended criteria and pregnant women. Recruitment efforts included:

- (1) ATSDR and MCHD met with community leaders approximately 10-12 weeks before the EI to discuss the proposed EI and solicit community input and support in contacting potential participants.

- (2) ATSDR developed and distributed a fact sheet to the public that described the EI 10-12 weeks prior to the EI initiation in cooperation with MCHD. The fact sheet included a toll-free number that participants could call to schedule an appointment for testing and a separate toll free ATSDR Information line for residents to ask additional questions about the EI. MCHD distributed the fact sheet to residents of Superior, MT through locally established distribution methods to include local schools, local medical facilities, community organizations and a local health fair on June 5, 2010. EPA provided information to MCHD and ATSDR for the location of properties that were found to have elevated soil samples for lead and arsenic. Those families known to have elevated lead and/or arsenic soil samples on their property following the most recent EPA soil sampling in 2009 were contacted by telephone or through one-on-one interaction by MCHD personnel to encourage their participation in the EI if they had family members who met the initial criteria for participation.
- (3) Assuming that residents of Superior, MT are likely to respond more positively to interaction with local public health officials in the recruitment effort, personnel from the MCHD led the effort to contact and recruit residents to participate in this EI in the 8-10 weeks preceding the planned EI. MCHD personnel distributed flyers provided by ATSDR and contacted residents who were pregnant or had children of the appropriate age for the EI.
- (4) A toll free ATSDR Superior, MT EI appointment line was established 8-10 weeks prior to the EI to provide an opportunity for Superior residents to make an advance appointment for blood lead and urinary arsenic testing. On making this appointment, participants were advised of the opportunity to obtain urine specimen cups in advance and were also asked to avoid consuming fish and shellfish for five days prior to the testing appointment time.
- (5) In addition to the toll free appointment line, a separate toll free ATSDR information line was established 8-10 weeks prior to the EI to provide an opportunity for Superior residents to contact ATSDR directly for additional information about the EI.
- (6) The decision was made to expand participation two weeks prior to the sample collection phase of the EI to residents of any age in Superior, MT. ATSDR worked closely with the MCHD to inform the local community of this change. This information was disseminated through flyers posted throughout the community and by contacting residents known to have elevated lead and/or arsenic soil samples on their property by telephone or through one on one interaction with the MCHD to advise them of the change in participation criteria.

### **3. Field Activities**

#### **a. Community Health Education**

ATSDR, in cooperation with MCHD, made presentations to the public, town and county

commissioners, as well as area clinicians 8-10 weeks prior to the EI to provide information about the potential risks of exposure to elevated levels of lead and arsenic and to encourage residents to participate in the EI. In addition, ATSDR, in partnership with MCHD, developed informational flyers and announcements that were distributed to local residents 8-10 weeks prior to the EI and again approximately 4 weeks prior to the EI. These materials advised residents of the potential health hazard from elevated lead and arsenic in the soil as well as the availability of testing during this EI for eligible residents. The EI residents who had made an appointment for testing were contacted one week prior to the sample collection to remind them of their appointment and to remind them to avoid consuming fish or shellfish for the 5-day period preceding their EI appointment.

## **b. Questionnaire**

During the EI appointment ATSDR administered a questionnaire. The questionnaire solicited contact and demographic information from the participants and also included questions to assess potential exposures to lead and arsenic as a result of daily activities (See Appendix B).

## **c. Biological testing**

ATSDR worked closely with MCHD personnel to identify and obtain permission to use the Superior High School Multipurpose Room and several adjacent rooms as a central location in this small community for collection of blood and urine samples from participants.

Each adult participant was asked to complete the applicable informed consent form. Parents or guardians of children less than 18 years of age were asked for written permission to have their eligible children/wards participate. Children ages 7-17 years old were also asked to grant their assent to be in the investigation.

### **i. Blood Lead Collection**

A phlebotomist collected a 3 ml blood specimen in tubes that were specifically determined to be appropriate for use for blood lead samples as determined by the NCEH Environmental laboratory. To maintain privacy, the tubes were labeled with a coded identification number. After collection, ATSDR maintained the blood samples at refrigerator temperature (4° C) and shipped them on ice packs to the MDPHSL in a timely manner for analysis.

### **ii. Urinary Arsenic Collection**

Children under 6 years of age were not included in the biological sampling for urinary arsenic because there was no adequate reference value available to interpret the results. EI participants for urinary arsenic sampling were children between the age of 6 and 17 years of age, pregnant women and other adults. Because the participant population for this EI was primarily children, a random “spot” sample of urine was collected due to ease of collection rather than a 24 hour urine collection (the collection of all urine produced by an individual in a 24 hour period of time). An effort was also made to provide an opportunity to pick up a urine specimen cup and plastic storage bag the week prior to the participant’s appointment time for parents of young children

who made an appointment for testing. Parents were given specific instructions on how to collect and store the urine specimen until their appointment time. Parents were given the option to assist their child to obtain a first morning void or spot void on the day of the scheduled appointment prior to their scheduled appointment time.

Collection cups and handling instructions were made available for pick up in advance to all participants who signed up for an appointment through the MCHD the week prior to the sample collection. MCHD individually labeled the specimen cup with the participant's name. The participant or their parent was instructed on how to collect and properly store a first-morning void or spot urine void of at least 30 ml by the MCHD. The participant or parent was requested to note the time of collection on the urine sample cup and then was instructed that the urine cup should be capped, bagged, and placed in a refrigerator until given to ATSDR.

Those participants unable to obtain a urine collection cup in advance and who were unable to provide a spot void at the time of their appointment were given a urine collection cup and written urine collection instructions. They were asked to obtain a first morning void or spot void sample and return the following day with the urine sample.

#### **d. EI Activities and Sample Collection Schedule**

The EI activities and sample collection process was available to participants on the following schedule:

Day 1:

- Obtain consent/assent and/or parental permission
- Administer questionnaire
- Collect blood sample
- Collect spot urine sample if obtained in advance by the participant
- If no advance specimen obtain a spot urine sample if able to provide
- If unable to obtain spot urine sample provide collection material and instructions for first morning void or spot urine sample to be brought in the following day

Day 2:

- Administer consent/assent form
- Administer questionnaire
- Collect blood sample
- Collect urine sample if obtained in advance by the participant
- If no advance specimen available obtain a spot urine sample if able to provide
- Collect urine sample from Day 1 participants as needed

Note: Urinary arsenic testing was not done on Day 2 participants who did not collect a urine specimen in advance and were unable to provide a spot urine specimen during their clinic visit.

Note: The protocol originally called for 3 days of sample collection but because not all available appointments were filled only 2 days were required.

#### **e. Environmental Testing - Home Tap Water Collection**

Five participants in the EI with children less than 11 years of age residing in the home who made an advance appointment for testing were asked to provide a first morning draw home tap water sample for lead testing. An adult from the residence was asked to complete the applicable informed consent form. Water sample bottles appropriate for lead water testing were provided by the MDPHSL and made available in advance to participants through the MCHD along with an instruction sheet on how to obtain a first draw tap water sample.

#### **f. Sample Handling and Shipping**

##### **i. Blood Lead**

The blood samples were maintained at an appropriate refrigerator temperature (4° C) after collection during the EI and then at the end of the EI all collected samples were shipped by overnight delivery to the MDPHSL for analysis. To maintain privacy, the samples were labeled with a coded identification number. In addition, a number of known blood lead specimens provided by the NCEH environmental laboratory were provided to the MDPHSL for analysis to evaluate laboratory performance. All blood samples were then forwarded to the NCEH laboratory for confirmatory analysis.

##### **ii. Urinary Arsenic**

ATSDR staff received the urine samples from participants and then aliquoted samples into three separate cryovials (urinary arsenic, speciated urinary arsenic and urinary creatinine) and then froze them on receipt from the participant using dry ice. Samples were maintained frozen until the conclusion of the EI and then shipped frozen on dry ice by FedEx overnight to the NCEH Environmental laboratory for analysis. To maintain privacy, the samples were labeled with a coded identification number.

##### **iii. Water Sample for Lead**

ATSDR collected water sample bottles from the previously identified participants at the time of their appointment for the EI. Sample bottles were stored at room temperature until the conclusion of the EI and then were shipped overnight to the MDPHSL for analysis. To maintain privacy, the samples were labeled with a coded identification number.

#### **4. Lab Processing and Analysis**

##### **a. Blood Lead**

The MDPHSL analyzed blood samples from 63 EI participants for lead concentration using anodic stripping voltammetry (7). The lower detection limit was 1.0  $\mu\text{g}/\text{dL}$  and the upper detection limit was 63.2  $\mu\text{g}/\text{dL}$  using the current calibrator with a variation range of +/- 2.0  $\mu\text{g}/\text{dL}$ . Results were reported as micrograms of lead per deciliter of blood ( $\mu\text{g}/\text{dL}$ ). In addition to the EI samples, 10 blood specimens with known levels of lead were provided to the MDPHSL

by the NCEH environmental laboratory to evaluate laboratory performance. Initial results provided by the MDPHHS� found all samples to be below the lower detection limit of 1.0  $\mu\text{g}/\text{dL}$ . However results of analysis of the 10 blind samples provided by the NCEH Laboratory suggested the possibility of a poor correlation with NCEH laboratory analysis. As a result all samples were forwarded to the NCEH laboratory for confirmatory analysis using electrothermal atomic absorption spectrometry (ETAAS), the same analytical procedure used in the NHANES testing.

### **b. Urinary Arsenic**

The urine samples were analyzed using published methodologies by the NCEH laboratory. NCEH analyzed the urine samples for total urinary arsenic, speciated urinary arsenic when indicated and creatinine (1).

### **c. Water Sample for Lead**

The MDPHHS� analyzed the home tap water specimen for lead concentration. The action level for water samples is based on the current EPA recommended action level of 0.015 mg/L (15 ppb) as defined in the EPA Lead and Copper Monitoring and Reporting Guidance for Public Water Systems (3). The MDPHHS� analyzed the home tap water specimen for lead concentration in accordance with the recommendations of this EPA Guidance. The Method Detection Limit (MDL) was 0.001 mg/L.

## **G. Results**

### **1. Participants in the Exposure Investigation**

ATSDR conducted the field activities for this EI on July 13-14, 2010. During this time, we collected blood samples from 63 residents of Superior, MT. The 2007-2008 National Health and Nutrition Examination Survey (NHANES) provided reference levels for blood lead, total and speciated arsenic in urine in adults and children 6 years old and older (2). Prior NHANES reports had only provided reference levels for total arsenic. Because there were no adequate reference values for arsenic in urine in this age group it was not collected from children under 6 years of age. As a result only 48 of the 63 participants that had blood lead testing also had urinary arsenic testing.

The age of the participants ranged from 11 months to 74 years of age, with thirty (47.6%) of the participants being under the age of 18. Twenty three participants met the initial criteria for the EI of children under the age of 12. In addition one participant was pregnant. The average age of the test population was approximately 29.8 years old.

Based on information provided from the questionnaires, 5 (7.9%) of the participants self-reported their ethnicity as being Hispanic or Latino. The remainder self-reported their ethnicity as Non-Hispanic. The self-reported race of the participants was White for all 63 participants.

## 2. Environmental Testing – Home Tap Water

Tap water samples were collected from five homes. Three homes reported that the main source of drinking water in the home was from a private well and two reported that the main source of drinking water in the home was from city public water. The level of concern for water samples in the EI was based on the current EPA recommended action level of 0.015 mg/L (15 ppb). No sample concentration exceeded this value. The results are presented in Table 1.

	Water Samples (n=5)		
	EPA Action Limit (mg/L)	Range	Mean
Lead (mg/L)	0.015	<0.001 - 0.003 <sup>1</sup>	0.0017

(1) Lead concentrations below the Method Detection Limit (MDL) of <0.001 mg/L were calculated as MDL/√2

## 3. Blood Lead Testing

The MDPHSL initially analyzed blood samples from all 63 EI participants for lead concentration using anodic stripping voltammetry. As previously noted, analysis of 10 blind samples provided by the NCEH Laboratory suggested the possibility of a poor correlation with NCEH laboratory analysis. As a result all samples were forwarded to the NCEH laboratory for confirmatory analysis. The results of the NCEH confirmatory analysis are presented in Table 2.

Age (years)	NHANES Blood Lead <sup>1</sup>		EI Blood Lead (n=63)		
	GM <sup>2</sup>	95 <sup>th</sup> %	GM <sup>2</sup>	N>95% <sup>3</sup>	Range
1-5 (n=15)	1.51	4.10	1.27	0	0.60 - 3.01
6-11 (n=8)	0.99	2.50	1.03 <sup>4</sup>	0	0.51 - 2.28
12-19 (n=7)	0.80	1.90	0.83 <sup>4</sup>	0	0.58 - 1.47
20+ (n=33)	1.38	3.90	1.09	0	0.31 - 2.79
Total	1.27	3.70	1.09	0	0.31 - 3.01

(1) 95<sup>th</sup> percentile of NHANES Reference Range (CDC 2009)  
 (2) GM = Geometric Mean  
 (3) Number of samples greater than the NHANES 95<sup>th</sup> percentile  
 (4) Although participant geometric mean is slightly higher than NHANES geometric mean it is within the 95% confidence interval.

## 4. Urinary Arsenic Testing

NHANES provides reference levels for total and speciated arsenic in urine for adults and children 6 years old and older (2). There are no standard reference levels available for children under 6 years of age. For this reason the 15 children under 6 years of age are not included as participants in this EI for urinary arsenic evaluation. The NCEH laboratory analyzed urine samples from 48 of the 63 participants in the EI. To correct for urinary dilution NCEH analyzed

the urine samples for urinary total arsenic and creatinine. This is the common method to determine a creatinine corrected total urinary arsenic result. For participants with a creatinine corrected total urinary arsenic greater than 10 µg/g of creatinine, a creatinine corrected total speciated urinary arsenic level was also determined to differentiate between levels of inorganic and organic urinary arsenic species. NCEH analyzed the urine specimens using the same analytical procedures used in the NHANES testing. For methodology see Appendix C of the *Fourth National Report on Human Exposure to Environmental Chemicals (I)*. The results of the NCEH analysis are presented in Table 3.

Table 3: Creatinine corrected total urinary arsenic (µg/g of creatinine) in EI participants.

Age (years)	NHANES Urinary Arsenic <sup>1</sup>		EI Urinary Arsenic (n=48)		
	GM <sup>2</sup>	95 <sup>th</sup> %	GM <sup>2</sup>	N>95% <sup>3</sup>	Range
6-11 (n=8)	8.87	37.2	8.47	0	5.4 - 21.0
12-19 (n=7)	5.49	22.5	5.61 <sup>4</sup>	0	4.0 - 9.1
20+ (n=33)	9.01	59.4	7.57	0	2.9 - 42.3
Total	8.47	49.8	7.38	0	2.9 - 42.3

(1) 95<sup>th</sup> percentile of NHANES Reference Range (CDC 2009)  
(2) GM = Geometric Mean  
(3) Number of samples greater than the NHANES 95<sup>th</sup> percentile  
(4) Although participant geometric mean is slightly higher than NHANES geometric mean it is within the 95% confidence interval.

Ten of the 48 participants sampled had creatinine corrected total urinary arsenic greater than 10 µg/g of creatinine. The urine samples of these 10 participants underwent further analysis by the NCEH Laboratory to determine the sum of urinary inorganic-related urinary arsenic species (arsenous acid, arsenic acid, dimethylarsonic acid [DMA] and monomethylarsonic acid [MMA]) present in their specimen. The limit of detection (LOD) for the sum of inorganic-related urinary arsenic species was 4.8 µg/L. The results of the NCEH analysis are presented in Table 4.

Table 4: Urinary Inorganic-related Arsenic Species (µg/g of creatinine) in EI participants with creatinine corrected total urinary arsenic >10 µg/g of creatinine.

Age (years)	NHANES Urinary Inorganic-related Arsenic Species 95 <sup>th</sup> % <sup>1</sup>	EI Urinary Inorganic-related Arsenic Species (n=10)	
		N>95% <sup>2</sup>	Range
6-11 (n=2)	14.7	0	7.6 – 14.7
12-19 (n=0)	16.7	N/A	N/A
20+ (n=8)	19.4	0	<LOD – 11.4
Total	18.9	0	<LOD - 14.7

(1) 95<sup>th</sup> percentile of 2003-04 NHANES Reference Range (Caldwell et al. 2008). 95<sup>th</sup> percentile of urinary inorganic-related arsenic species not yet available from 2005-06 and 2007-08 NHANES data.  
(2) Number of samples greater than the NHANES 95<sup>th</sup> percentile

## **H. Discussion**

Lead is a naturally occurring element in the earth's crust, where it combines with other elements such as oxygen and sulfur. Lead is contained in many products such as ammunitions, old water pipes and their soldered connections, automotive radiators, pewter, pottery, folk medicines, leaded crystal glass, and as a contaminant in trace amounts in many products. Because of health concerns, lead is no longer added to gasoline and house paints but may still be found in paint found on older homes. People can be exposed to lead by breathing air, drinking water, eating food, or swallowing dust or dirt that contains lead. Children are commonly exposed to lead from hand-to-mouth activities involving contaminated dust and soils. Important sources are older homes that contain lead-based paint or from eating paint chips that contain lead or ingesting lead dust as part of normal hand-to-mouth activities. Children can be exposed to more lead than adults because of these activities, require less lead to raise their blood lead level by the same amount, and may be more adversely affected by the exposure because of their developing bodies. Soil with elevated levels of lead may comprise another source of exposure for children (8, 9, 10).

Arsenic is a naturally occurring element that is found in combination with either inorganic or organic substances to form many different compounds and often occurs naturally with lead. Inorganic arsenic compounds are of greater concern for toxicity than organic arsenic compounds and are found in soils, sediments, and groundwater. These compounds occur naturally or as a result of mining, ore smelting, and industrial use of arsenic. Organic arsenic compounds are found mainly in fish and shellfish. People are most commonly exposed to organic arsenic by consuming seafood. People are most likely to be exposed to inorganic arsenic through drinking water and to a lesser extent through various foods. Water sources in some parts of the United States have higher naturally occurring levels of inorganic arsenic than other areas. Other potential sources of inorganic arsenic exposure can include contact with contaminated soil (11, 12).

Residents of Superior, MT, and children in particular, may be at a higher risk of exposure to lead and arsenic because of the high levels of lead and arsenic that have been identified in the soil of residential and public properties in Superior, MT resulting from the use of mine tailings as fill material in the past.

### **1. Environmental Testing – Home Tap Water**

Most residents living in the town of Superior receive drinking water from the PWS, but a few homes obtain water from private wells. In general, these private wells draw water from the deep aquifer which is believed to be confined. This provides a measure of protection from potential surface water contamination. However, several homes have private wells that may draw water from a zone that is not in the deep aquifer. It is not known whether these wells are currently used as a drinking water source (4).

Five participants provided a sample of their home tap water for evaluation for lead. Two of these homes were connected to the PWS while three used individual private wells as their primary water source. All water samples were found to be below the EPA Action Level of 15 µg/L for lead in drinking water. The average and maximum lead levels of all 5 samples were 1.7 and 3

$\mu\text{g/L}$ , respectively. Lead was not detected above EPA's Action Level in the drinking water samples obtained for this EI at concentrations that pose a public health hazard. Although values were found to be below the EPA Action Level it is prudent public health practice to ensure lead concentrations are kept as low as possible.

## **2. Biological Testing - Blood Lead**

Blood lead levels increase quickly after an acute exposure, then reach equilibrium with body stores of lead gradually over weeks. Lead is distributed unevenly within the human body. For example, in children approximately 70% is stored in the bone compartment and the residence time of lead in bone can be decades. As a result an elevated blood lead level will decline within a few weeks to months after an acute exposure (13,14,15). Studies have also confirmed that blood lead measurements vary seasonally. A study conducted in Boston reported that blood lead levels were highest in late June and lowest in March and a Milwaukee study indicated that blood lead levels were higher in the summer than in the winter (16-19). Some of this seasonal variation may result from increased exposure to lead in dust and soil in summer months.

The most recent available documented blood lead testing for residents of Superior, MT was done in February 2002 by the MCHD. At that time all blood lead concentrations were below  $10 \mu\text{g/dL}$  among the 66 people tested including 8 children below the age of 7 who had a range of blood lead levels between 1 –  $2.6 \mu\text{g/dL}$ .

This EI was done during the summer month of July 2010 to reflect peak exposure levels to soil, sediment and waste tailings, during the period when outdoor activities occur and the ground is not frozen or covered by snow. Participants in this EI again had blood lead concentrations below  $10 \mu\text{g/dL}$  in all cases. However it should be noted that while CDC defines the BLL that should prompt public health actions as  $10 \mu\text{g/dL}$ , CDC also recognizes that a BLL of  $10 \mu\text{g/dL}$  does not define a threshold for the harmful effects of lead (20-23). In this EI, participants were all also below the NHANES reference range for their age category with a range of  $0.31 - 3.01 \mu\text{g/dL}$  as indicated in Table 2. In two age groups (age 6-11 and 12-19) the geometric mean was found to be slightly higher for participants as compared to the NHANES reference range but both are based on a very low sample size and are well within the 95% confidence limit for the NHANES geometric mean.

Only one participant in the EI was pregnant at the time of testing. This participant had a blood lead level of  $0.31 \mu\text{g/dL}$  which was below the NHANES 95<sup>th</sup> percentile for her age group (20 and older) of  $3.90 \mu\text{g/dL}$ .

## **3. Biological Testing – Urinary Arsenic**

Biomonitoring for exposure to arsenics is usually conducted by analyzing urine samples from potentially exposed people. After a person ingests inorganic arsenic compounds, the absorbed arsenic is metabolized primarily by the liver and excreted by the kidneys into the urine within a few days after exposure. Because arsenic is rapidly metabolized and excreted from the body, a urine sample needs to be collected soon after exposure has occurred. Studies have shown that the urinary excretion of arsenic occurs very quickly. In one study after human volunteers drank

water containing a 500 $\mu$ g dose of arsenic as sodium arsenite, they were monitored over a four day period. About half of the amount of arsenic that was excreted during the four day period was excreted within the first 28 hours. Arsenic excretion then gradually tapered off over the next three days (24). As a result a spot urine sample for arsenic will only demonstrate exposure over the previous day or two as most of the arsenic from prior to that time will have already been excreted (25-29).

The most recent available documented urinary arsenic testing for residents of Superior, MT was done in February 2002 by the MCHD. Seventeen Superior, MT residents provided a urine sample to test for urinary arsenic. All 17 residents had urinary arsenic levels below the reported detection limit of 5  $\mu$ g/L. No urine samples were taken in children.

Because there are no standard reference levels available for children under 6 years of age, only 48 of the 63 EI participants underwent testing for urinary arsenic levels. In order to correct for the potential impact of urinary dilution, all spot urine samples were also evaluated for creatinine to correct for potential changes in urine volume and concentration that result from variability in fluid intake and loss. None of the participants had a result that was greater than the NHANES upper 95<sup>th</sup> percentile reference range for their age category with a range of values from 2.9 – 42.3  $\mu$ g/g of creatinine as indicated in Table 3. In the 12-19 age group the geometric mean was found to be slightly higher for participants as compared to the NHANES reference range but is well within the 95% confidence limit for the NHANES geometric mean. The geometric means for participants in other age categories were at or below the NHANES geometric mean.

Inorganic arsenic is more toxic or harmful than organic arsenic. In studies conducted in the United States and Europe, the average background concentrations of inorganic arsenic and its metabolites in the urine are generally below 10  $\mu$ g/L. In a population with low-level environmental arsenic exposure, it has been reported that unadjusted and creatinine-adjusted urinary concentrations of inorganic arsenic were significantly correlated (25). In this investigation, EI participants with a creatinine corrected total urinary arsenic above 10  $\mu$ g/g of creatinine underwent additional analysis for speciated urinary arsenic to determine the amount of inorganic urinary arsenic present in their specimen. Speciated urinary arsenic assessment can distinguish between exposure to inorganic arsenic and its metabolites and the relatively nontoxic forms of organic arsenic. Organic arsenic is generally found in dietary sources such as seafood (25). Information from the questionnaire indicated that this community of participants self-reported that they did not consume a large quantity of seafood. Only 15 of 63 participants (23.8%) reported consumption of any seafood in the 3-4 days prior to their EI appointment. Evaluation of speciated urinary arsenic was possible because the NCEH Laboratory at CDC published data for speciated urinary arsenic concentrations beginning with the 2003–2004 NHANES (2) providing a reliable reference range to evaluate speciated arsenic results. These data are representative of the civilian, non-institutionalized population of the United States and are categorized by age, gender, and self-reported race/ethnicity. In the 2003-2004 NHANES data they found that for inorganic arsenic plus its metabolites, MMA and DMA, the 95th percentile concentration was 18.9  $\mu$ g/L across all age categories and as low as 14.7  $\mu$ g/L for children from 6-11 years of age.

Of the 10 participants with a creatinine corrected total urinary arsenic level greater than 10  $\mu\text{g/g}$  of creatinine, none had a total sum of urinary inorganic-related arsenic species greater than the upper 95% percentile of the NHANES reference range as shown in Table 4. One participant in the 6-11 year old category had a result that was equal to the NHANES 95<sup>th</sup> percentile reference range. Although the concentration was at the upper end of the reference range, it was well within the reported 95% confidence interval surrounding the NHANES 95<sup>th</sup> percentile (2). In addition the participant had arsenobetaine in the urine, which indicates recent fish/shellfish consumption. Fish and shellfish also contain DMA and MMA, which were the major contributors to the total inorganic arsenic concentration in the urine sample. The participant also had a very low blood lead concentration. If the participant had been ingesting soil contaminated with lead and arsenic he would also be expected to have an elevated blood lead level compared to the NHANES reference range. But the participant's blood lead level was 0.66  $\mu\text{g/dL}$ , well below the NHANES reference range of 3.00  $\mu\text{g/dL}$  for his age group. These findings indicate that this result is not an indication of environmental exposure.

#### **4. Notifying the Community of Test Results**

In September 2010, ATSDR sent a letter to each participant of the EI to notify them of their test results. In addition, ATSDR provided a toll-free telephone number so that participants could contact an ATSDR physician to discuss their individual test results.

#### **5. Child Health Considerations**

In general BLLs peak in early childhood, when young children are especially vulnerable to lead, as shown in the NHANES reference values for lead (1). Initially the target population of this EI was children and in particular children under the age of 11 who are more likely to have significant exposure to soil because of a higher likelihood of soil ingestion through hand to mouth transfer and other behaviors that result in a higher potential for exposure. We tested a total of 23 children under the age of 11 and 30 children under the age of 18 for lead and arsenic (15 of these children who were under the age of 6 were not tested for arsenic). Despite the elevated levels of lead and arsenic found in the soil of residential and public properties where children were present, testing found no evidence of elevated lead or arsenic levels in the younger age groups in this EI as compared to the NHANES reference values. It was, however, evident that the median BLL was highest for children aged 1-5, which is consistent with the NHANES reference values.

### **I. Conclusions**

- (1) The concentrations of blood lead and urinary arsenic in all EI participants were within the upper 95<sup>th</sup> percentile of a national reference range. In addition all BLLs in this EI, including those for children below the age of 6, were below 10  $\mu\text{g/dL}$ , the CDC defined BLL that should prompt public health action.
- (2) The concentration of lead in home tap water samples evaluated in this EI were well below the EPA Action Level in all samples, including three from private wells and two from the public water supply.

(3) As previously noted, based on the available sampling data from the previous blood lead and urinary arsenic samples obtained by MCEHP in 2002, residents of Superior showed no evidence of unusual exposure to lead and arsenic soil concentrations during the period just prior to their blood and urine sample collection. Residents of this area have been aware of the possibility of elevated lead and arsenic levels in soil since at least 2002 when MDEQ requested that EPA evaluate the town for possible soil removal action. As a result they may be sufficiently well educated about how to minimize their risk of exposure. But extremely high levels of lead and arsenic contamination of soil on residential properties are still present in the town of Superior, MT. Maximum concentrations for residential properties in 2002 were 16,700 ppm for lead and 2,620 ppm for arsenic (4). Additional testing of residential property performed by EPA in 2009 found a maximum concentration for lead of 12,576 ppm and for arsenic of 2,841 ppm (5). This EI included participants from residential properties that were identified to have soil lead levels above 2,999 ppm and soil arsenic levels above 399 ppm although as has been noted none of the participants in this EI had an elevated blood lead or urinary arsenic level. But the extremely elevated levels of lead and arsenic that still remain in the soil of residential properties in the town of Superior suggest that the potential for exposure still exists, particularly for young children who are the most vulnerable population.

## **J. Recommendations**

- (1) Although current biologic levels are low, exposures to lead and arsenic can be minimized by reducing exposure to dust and soil by regular hand and face washing, especially before meals. Families can lower exposures by regularly cleaning the home of dust and tracked in soil, through the use of door mats, and by removing of shoes before entering the home. Planting grass and shrubs over bare soil areas in the yard can lower contact that children and pets may have with soil and the tracking of soil into the home.
- (2) EPA soil sampling in 2009 continued to identify high levels of lead and arsenic in soil samples of residential properties in Superior, MT. While blood lead and urinary arsenic levels are below a national reference range now, there is always the possibility that exposure could occur in the future. So to be protective, removal of soil for properties in Superior, MT that are in excess of the clean up level determined by EPA should continue as planned.
- (3) Further biological monitoring is not warranted unless new evidence becomes available to document that residents living in Superior, MT are being exposed to lead or arsenic at levels of health concern.
- (4) Local health care providers should continue to be aware of the potential for exposure to lead and arsenic in the community and have a low threshold for testing for lead and arsenic if symptoms warrant it. Consideration should be given to annual testing for lead in children under the age of six to monitor for new evidence of exposure to lead in this high risk age group.
- (5) Health education and outreach activities should continue to ensure that community members minimize contact with contaminated soil.

## **K. Acknowledgements**

ATSDR thanks Peggy Stevens and the staff of the Mineral County Health Department for their help in identifying, educating and recruiting community members to participate and their assistance with field activities in this EI.

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## **Appendix A:**

### **Letter from Montana Department of Environmental Quality**



Montana Department of  
ENVIRONMENTAL QUALITY

Brian Schweitzer, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • www.deq.mt.gov

December 5, 2005

Ms. Brenda Schneider  
Superior, Town of  
P.O. Box 729  
Superior, Montana 59872

RE: Evaluation of Full Waiver Request for Lead and Copper Monitoring for PWS# MT0000339,  
Superior, Town of

Dear Ms. Schneider:

The Department has processed your request for a full waiver under the Montana Lead and Copper Rule as authorized under ARM 17.38.216(3)(o). Based on your latest set of samples and the letter of request dated November 8, 2005, we are happy to grant the full waiver for lead and copper monitoring and assign reduced monitoring to your public water supply.

Your monitoring frequency is now reduced to one sample set (ten sample taps) every nine years. Your next set of samples will be due in the period 2011 to 2013.

If you have questions or need any other materials, please call me at (406) 247-4412.

Sincerely,

Kerry Schmelzer  
Water Quality Specialist  
DEQ, Public Water and Subdivisions Bureau  
Public Water Supply Section  
(406) 247-4412; kschmelzer@mt.gov

cc: File MT0000339  
LCR waivers

**Appendix B:**  
**Exposure Investigation Protocol**



## **Exposure Investigation Protocol**

### **Biological Monitoring for Exposure to Lead and Arsenic**

**Superior, Mineral County, Montana**

Cost Recovery Number 80ER

**April 12, 2010**

Prepared by:

Bruce Tierney, MD

Lourdes Rosales-Guevara, MD

Karen Scruton, MS

ATSDR/DHAC/EISAB

## Objective and Rationale

This exposure investigation (EI) will assess blood lead levels in children between the ages of 9 months and 11 years and urine arsenic levels of children who are between the ages of 6 years and 11 years who are residents of Superior, MT. This EI is being conducted as a result of high lead and arsenic levels found in soil samples obtained in Superior, MT by the Environmental Protection Agency (EPA) in the summer of 2009. The ATSDR Public Health Assessment for the Flat Creek IMM (Iron Mountain Mine and Mill) Site released in January 2010 concluded that that coming into frequent contact with heavy metals in the waste tailings could harm people's health.

## Introduction

The town of Superior, MT is located in close proximity to the IMM site. In the past, waste tailings from the IMM site were used as fill material in Superior, resulting in high levels of metals in town soils.

In January 2002, the [Montana Department of Environmental Quality](#) (MDEQ) requested that the EPA evaluate the town of Superior for a possible removal action based on data that reported high levels of lead and arsenic in town soils. In June 2002, EPA conducted additional surface and subsurface soil sampling and found multiple areas of Superior with soil containing elevated levels of arsenic and lead. For lead, 10 of 27 residential properties in Superior were found to have soil lead levels present above 400 parts per million (ppm) with a maximum concentration of 16,700 ppm. For arsenic, 11 of 29 residential properties were found to have arsenic concentrations greater than 20 ppm with a maximum concentration of 2,620 ppm. In August 2002, EPA began a time-critical removal action (TCRA) in Superior. Contaminated soils and waste tailings located in other areas, including rights-of-way and residential properties, were included in the removal action if the average surface soil concentration exceeded 400 ppm arsenic and/or 3,000 ppm lead. Overall, EPA removed approximately 6,500 cubic yards of contaminated tailings and soil from town locations.

Also in 2002, Mineral County Environmental Health and Planning (MCEHP) collected blood lead and urine arsenic samples from individuals living in Superior. In February 2002, 66 Superior residents were tested for lead exposure. All blood lead concentrations were below 10 µg/dL. Among the 66 people tested were eight children below the age of seven with a range of blood lead levels (BLL) between 1 – 2.6 µg/dL. In addition, seventeen Superior residents provided a urine sample to test for urinary arsenic. All 17 residents had urine arsenic levels below the detection limit of 5 µg/L. No urine samples were taken in children. Based on the available sampling data, results show that these adult residents of Superior were not exposed to unusual arsenic concentrations a few days (2–3 days) prior to their urine collection.

However, these blood and urinary samples were collected in February and may not represent peak exposure levels to soil, sediment and waste tailings, such as might occur in the summer when outdoor activities occur and the ground is not frozen or covered by snow.

The Agency for Toxic Substances and Disease Registry (ATSDR) became involved with the IMM site in 2002. A resident from Superior, MT contacted ATSDR to request that the agency initiate communication with Mineral County. In response, ATSDR reviewed soil and water sample results from Flat Creek, performed a site visit of the area, and communicated with local residents. ATSDR also worked with the EPA, the Montana Department of Public Health and Human Services (MDPHHS), and the MCEHP to create a fact sheet for the community.

In February 2004, the ATSDR received a petition for a public health evaluation of heavy metal contamination in soil and water in Superior, Montana. Residents expressed concern regarding exposures to waste tailings from the IMM site. Waste tailings from this mine site have washed down along the banks and floodplain of Flat Creek. Additionally, some waste tailings were used as fill material in the town. To address community concerns, ATSDR evaluated available data to determine whether harmful health effects are expected from exposures to heavy metal contamination in soil and water.

ATSDR concluded that coming into frequent contact with heavy metals in the waste tailings on the IMM site, the Flat Creek floodplain, and the town of Superior could harm people's health. Therefore, frequent, contact-intense activities with the waste tailings may result in exposures that are a public health hazard.

In April 2009, the U.S. Environmental Protection Agency (EPA) listed the Flat Creek IMM site on its National Priorities List (NPL), and the first phase of residential soil sampling occurred in the summer of 2009. This repeat testing by EPA identified soil at 67 properties in Superior, MT greater than 400 ppm of lead and 19 of those homes with soil lead levels greater than 2999 ppm with the maximum concentration found to be 12,576 ppm. In addition, soil arsenic levels were also noted to be greater than 20 ppm (maximum of 2841 ppm) in a number of the properties with elevated lead levels.

In November 2009, the Mineral County Health Department (MCHD) requested ATSDR assistance to conduct an EI to evaluate the potential for exposure of Superior, MT residents to lead and arsenic. This community concern resulted from the presence of continued high levels of lead and arsenic in the town soil. In addition, the previous blood and urinary results obtained in 2002 might not represent peak exposure levels to soil, sediment and waste tailings, such as those that might occur in the summer when outdoor activities occur. Finally, only a limited number of children, who are at a higher level of risk of exposure to soil contamination, were included in previous testing.

The potential for an exposure pathway for lead from the local water supply was also considered. Since the early 1900s, the majority of town residents have been connected to the public water supply (PWS). Previously, the PWS source for the town of Superior was a spring adjacent to Flat Creek. However, the Mountain Water Company (former PWS owner) discontinued use of Flat Creek Spring in 1997 when antimony was detected at concentrations above the EPA's maximum contaminant level (MCL). Currently, the spring is not in use, but it is maintained as an emergency drinking water source.

Ownership of the PWS was transferred from the Mountain Water Company to the town of Superior in October 2000. There are three production wells in the current system. All three wells are located within the city limits of the town of Superior and each has its own treatment plant. The town of Superior tests these wells for water quality in accordance with federal standards. 10 of 13 past samples of treated water from the PWS had lead detected but all were less than EPA's MCL of 15 ppb. The current PWS has a total of 430 connections.

Information obtained from the Mineral County sanitarian (see Appendix A) indicate that the town of Superior PWS applied for and received a full waiver for reduced monitoring for lead and copper from the Montana Department of Environmental Quality based on low levels in past sample testing and the non corrosive nature of the current water supply in December 2005. It is not clear from this documentation whether the last testing performed in August 2004 was performed at the water treatment plant or at home spigots in the town. The next testing for lead is scheduled for the 2011-2013 period.

Most residents living in the town of Superior receive drinking water from the PWS, but a few homes on the north side of town obtain water from private wells. In general, these private wells draw water from the deep aquifer which is believed to be confined. However, several homes do have wells that draw water that may not be from the deep aquifer. It is not known whether these wells are currently used as a drinking water source.

## **Project Overview**

### **A. Purpose**

ATSDR will conduct biological monitoring for exposure to lead in pregnant women and children between the ages of 9 months and 11 years and for exposure to arsenic in pregnant women and children between the ages of 6 years and 11 years in Superior, MT. In addition up to 5 participants in the EI with children meeting the EI criteria will be asked to provide a home water sample for lead testing. Participation in this sampling will be on a voluntary basis and will not affect the ability of the participant to obtain blood lead and urinary arsenic testing.

Sampling of home tap water (for lead), blood (for lead) and urine (for arsenic) will occur during the week of July 12<sup>th</sup>, 2010 when outdoor activities are near their peak. This EI will consist of two parts. First, a community education program will be presented to residents and health professionals to advise them of the potential risk of lead and arsenic in the community and to encourage targeted residents to participate in the testing program. The biological and environmental monitoring will be conducted using validated, state-of-the-science analytical methodologies. The results of this investigation will give the residents tested accurate information on their current level of exposure to lead and arsenic. In addition to biological and environmental sampling, EI participants (or their parents) will answer a brief questionnaire to assist ATSDR in the interpretation of the results of biological sampling.

### **B. Investigators and Collaborators**

The ATSDR/DHAC/EISAB will be the lead agency for this EI.

EISAB will:

- (1) Work with the MCHD and the community to recruit participants for the EI and provide community health education for lead and arsenic exposure.
- (2) Procure supplies for biological and environmental monitoring
- (3) Contract for local phlebotomists to draw blood samples
- (4) Administer consent/assent forms and questionnaires
- (5) Collect biological and environmental samples and ship them to laboratories for analysis
- (6) Evaluate the analytical test results
- (7) Notify the participants of their individual test results
- (8) Coordinate with the Environmental Protection Agency (EPA) to conduct the EI at a time that will minimize impact on the EI while also minimizing disruption of the planned remediation and additional soil sampling also planned for the summer time period when the EI will be conducted.
- (9) Write a report that summarizes the collective findings of the EI

ATSDR/DRO/Region 8/Montana Office will:

- (3) Will work in close cooperation with EISAB to complete the tasks assigned to it to include providing input on development and implementation of the EI and the final EI report.
- (4) Serve as the primary liaison between ATSDR and MCHD to facilitate coordination with local partners and the community.

MCHD will serve as the lead local agency for this EI and will:

- (1) Lead the effort in the community to recruit participants for the EI
- (2) Serve as the primary resource for education to the local community on the risks of exposure to elevated lead and arsenic concentrations.
- (3) Assist in conducting the biological and environmental sampling conducted in Superior, MT during the week of July 12<sup>th</sup>, 2010.

ATSDR/DHAC/HPCIB will:

(1) Assist the MCHD with developing resource materials for the community education program and providing health education to the community as requested by MCHD

(2) Work with EISAB and the MCHD to develop recruitment materials

National Center for Environmental Health (NCEH) will:

(1) Provide supplies for collecting blood and urine samples

(2) Analyze urine samples for the chemical of concern, arsenic, and conduct speciated arsenic analysis for participants with an initial elevated level arsenic. In addition they will measure the urine creatinine level.

(3) Provide reports of the individual results from the urine arsenic samples obtained from participants to ATSDR.

The Montana Department of Public Health and Human Services Laboratory will:

(5) Provide supplies for collecting home tap water samples for lead.

(6) Analyze blood samples for the chemical of concern, lead.

(7) Analyze home tap water samples for the chemical of concern, lead

(8) Provide the individual water lead and blood lead results to ATSDR.

The Superior, MT health community, in cooperation with MCHD, will:

(2) Assist ATSDR in identifying and recruiting participants for the EI.

## **METHODS**

### **A. Criteria for participation**

ATSDR will work with the MCHD to recruit residents with the highest potential exposures to lead and arsenic, especially those who live in residences identified by the EPA to have a high level of soil contamination. Exposure to lead and arsenic results primarily from waste tailings from the mine used as surface soil fill on public and residential properties in the town of Superior, MT. Participation in this EI will initially be limited to pregnant woman and children (If available appointments are not filled then participation may be opened to adult participants at a later date). Children who currently live in or near the town of Superior, MT, aged 9 months to 5 years will be tested for blood lead; children 6- 11 years of age will be tested for lead and arsenic. A total of 164 appointments are available to residents of Superior, MT for this EI. Residents are being encouraged to make an appointment if they wish to participate and walk-in participants will be seen on a space available basis only.

Several local residents requested testing for older residents of the community. Although older residents are less likely to have significant exposure to the soil, adult participants may be tested if participation of the specifically targeted participants is less than anticipated. The available appointment spaces will then be allotted to other adults on a first come, first served basis up to the maximum of 164 participants.

## **B. Recruiting participants**

ATSDR staff will work with the MCHD and the community to identify and offer testing to all families in Superior, MT with children meeting the recommended criteria and pregnant women. Recruitment efforts will include:

- (7) ATSDR and MCHD will meet with community leaders approximately 10-12 weeks before the EI to discuss the proposed EI and solicit community input and support in contacting potential participants.
- (8) ATSDR will also develop a fact sheet 10-12 weeks prior to the EI in cooperation with MCHD for distribution to the public that describes the EI. The fact sheet will include a toll-free number that participants can call to schedule an appointment for testing and a separate toll free ATSDR Information line for residents to ask additional questions about the EI. MCHD will distribute the fact sheet to residents of Superior, MT through locally established distribution methods to include local schools, local medical facilities, community organizations and a local health fair planned for June 5, 2010. EPA has provided information to MCHD and ATSDR for the location of properties that were found to have elevated soil samples for lead and arsenic. These families known to have elevated lead and/or arsenic soil samples on their property following the most recent EPA soil sampling in 2009 will be contacted by telephone or through one on one interaction by MCHD personnel to encourage their participation in the EI if they have family members who meet the criteria for participation.
- (9) Assuming that residents of Superior, MT are likely to respond more positively to interaction with public health officials that they are familiar with in the recruitment effort, personnel from the MCHD will lead the effort to contact and recruit residents to participate in this EI in the 8-10 weeks preceding the planned EI. MCHD personnel will distribute flyers provided by ATSDR and contact residents who are pregnant or have children of the appropriate age for the EI.
- (10) A toll free ATSDR Superior, MT EI appointment line will be established 8-10 weeks prior to the EI to provide an opportunity for Superior residents to make an advance appointment for blood lead and urine arsenic testing. When making this appointment participants will be advised of the opportunity to obtain urine specimen cups in advance and will also be asked to avoid consuming fish and shellfish for five days prior to the testing appointment time.

- (11) In addition to the toll free appointment line a separate toll free ATSDR information line will be established 8-10 weeks prior to the EI to provide an opportunity for Superior residents to contact ATSDR directly for additional information about the EI.

### **C. Community Health Education**

ATSDR in cooperation with MCHD will make presentations to the public, town and county commissioners as well as area clinicians 8-10 weeks prior to the EI to provide information about the potential risks of exposure to elevated levels of lead and arsenic and to encourage residents to participate in the EI. In addition ATSDR, in partnership with MCHD, will develop informational flyers and announcements to be distributed to local residents 8-10 weeks prior to the EI and again approximately 4 weeks prior to the EI. These materials will advise them of the potential health hazard from elevated lead and arsenic in the soil as well as the availability of testing during this EI for eligible residents. One week prior to the EI residents who have made an appointment for testing will be contacted to remind them of their appointment and to remind them to avoid consuming fish or shellfish for the 5-day period preceding their EI appointment.

### **D. Biological testing**

ATSDR will work closely with MCHD personnel to identify a central location in this small community to provide for collection of blood and urine samples from participants. The primary location recommended by MCHD for conducting the EI is the Superior High School Multipurpose Room and several adjacent rooms.

Each adult participant will be asked to complete the applicable informed consent form. Parents/guardians of children will be asked for permission to have their eligible children/wards participate. Children ages 7-11 years old will also be asked to grant their assent to be in the investigation (see attached Appendix B).

### **Blood Lead Collection**

A phlebotomist will collect a 3 ml blood specimen in tubes that are specifically determined to be appropriate for use for blood lead samples as determined by the NCEH Environmental laboratory. To maintain privacy, the tubes will be labeled with a coded identification number. After collection, ATSDR will hold the blood samples at refrigerator temperature (4° C) and ship them on ice packs to the Montana Department of Public Health and Human Services Laboratory in a timely manner for analysis.

### **Urine Arsenic Collection**

Children under the age of 6 will not be included in the biological sampling for urine arsenic because there is no adequate reference value available to interpret the results. EI participants will be children between the age of 6 and 11 years as well as pregnant women. Urine arsenic is the most reliable method for measuring arsenic exposure, particularly exposures occurring within a

few days of the specimen collection. Although a 24-hour urine collection is considered an optimal sample due to fluctuations in excretion rates, most exposure studies have used a first morning void or random “spot” sample due to ease of collection. Under steady state exposure conditions, as would be assumed for residents of this community, random or spot urine results have correlated well with 24-hour results. Because the participant population for this EI is primarily children, an effort will be made to provide an opportunity to pick up a urine specimen cup and plastic storage bag the week prior to the participants appointment time. Parents will be given specific instructions on how to collect and store the urine specimen until their appointment time. Parents will be given the option to assist their child to obtain a first morning void or spot void on the day of the scheduled appointment prior to their scheduled appointment time.

Collection cups and handling instructions will be made available for pick up in advance to all participants who have signed up for an appointment through the MCHD the week prior to the EI. MCHD will individually label the specimen cup with the participants name when they are picked up. The participant or their parent will be instructed on how to collect and properly store a first-morning void or spot urine void of at least 30 ml. The participant or parent should note the time of collection on the urine sample cup. The urine cup should then be capped, bagged, and placed in a refrigerator until brought by the participant to ATSDR for collection.

Those participants unable to obtain a urine collection cup in advance and who are unable to provide a spot void at the time of their appointment will be given a urine collection cup and written urine collection instructions. They will then be asked to obtain a first morning void or spot void sample and return the following day with the urine sample.

The blood and urine collection process will be available to residents on the following schedule:

Day 1:

- Administer consent/assent form (Appendix B)
- Administer questionnaire (Appendix C)
- Collect blood sample
- Collect spot urine sample if obtained in advance by the participant
- If no advance specimen obtain a spot urine sample if able to provide
- If unable to obtain spot urine sample provide collection material and instructions for first morning void or spot urine sample to be brought in the following day

Day 2:

- Administer consent/assent form (Appendix B)
- Administer questionnaire (Appendix C)
- Collect blood sample
- Collect urine sample if obtained in advance by the participant
- If no advance specimen available obtain a spot urine sample if able to provide
- If unable to obtain spot urine sample provide collection material and instructions for first morning void or spot urine sample to be brought in the following day
- Collect urine sample from Day 1 participants as needed

Day 3:

- Administer consent/assent form (Appendix B)

- Administer questionnaire (Appendix C)
- Collect blood sample
- Collect urine sample if obtained in advance by the participant
- If no advance specimen available obtain a spot urine sample if able to provide
- Collect urine sample from Day 2 participants as needed

Note: Urine arsenic testing will not be done on Day 3 participants who do not collect a urine specimen in advance and are unable to provide a spot urine specimen during their clinic visit.

## **E. Environmental Testing**

### **Home Tap Water Collection**

5 participants in the EI with children meeting the EI criteria will be asked to provide a first morning draw home tap water sample for lead testing. Each adult participant will be asked to complete the applicable informed consent form. Water Sample bottles will be provided by the Montana Department of Public Health and Human Services Laboratory and made available in advance to participants through the Mineral County Health Department along with an instruction sheet on how to obtain a first draw tap water sample.

## **F. Sample handling and shipping**

### **Blood Lead**

The blood samples will be maintained at an appropriate refrigerator temperature (4° C) after collection during the EI and then at the end of the EI all collected samples will be shipped by overnight delivery to the Montana Department of Public Health and Human Services Laboratory for analysis. To maintain privacy, the samples will be labeled with a coded identification number.

### **Urine Arsenic**

ATSDR will aliquot samples into three separate cryovials (urine arsenic, speciated urine arsenic and urine creatinine) and freeze them on receipt from the participant using dry ice. Samples will be maintained frozen until the conclusion of the EI and then shipped frozen on dry ice by FedEx overnight to the NCEH Environmental laboratory for analysis. To maintain privacy, the samples will be labeled with a coded identification number.

### **Water Sample for Lead**

ATSDR will collect water sample bottles from participants at the time of their appointment for the EI. Sample bottles will be stored at room temperature until the conclusion of the EI and will then be shipped overnight to the Montana Department of Public Health and Human Services Laboratory for analysis. To maintain privacy, the samples will be labeled with a coded identification number.

## G. Lab processing and analysis

### Blood Lead

The Montana Department of Public Health and Human Services Laboratory will analyze blood samples for lead concentration. Blood lead testing will be done by anodic stripping voltammetry. The lower detection limit is 1.0 µg/dL and the upper detection limit is 63.2 µg/dL using the current calibrator with a variation range of +/- 2.0 µg/dL. Results will be reported as micrograms of lead per deciliter of blood (µg/dL). In addition to the EI samples, a number of known blood lead specimens provided by the NCEH environmental laboratory will be provided to the Montana Department of Public Health and Human Services Laboratory for analysis to evaluate laboratory performance.

The blood lead level (BLL) of concern for public health action will be based on the current CDC recommendation of greater than or equal to 10 µg/dL. CDC has recognized that a BLL of 10 µg/dL does not define a threshold for the harmful effects of lead particularly in children since the current BLL of concern was defined in 1991. CDC notes that research conducted since 1991 has strengthened the evidence that children's physical and mental development can be affected at BLLs <10 µg/dL. But because of a lack of a threshold level for adverse health effects, setting a new BLL of concern somewhere below 10 µg/dL would be based on an arbitrary decision. In addition, the feasibility and effectiveness of individual interventions to reduce BLLs below 10 µg/dL has not been demonstrated. Further study is needed to assess the effects of BLLs <10 µg/dL on children. Such research will entail following large and diverse populations, with careful attention to potential confounders and measurements of social factors. Additional research also is needed to evaluate the effectiveness of strategies to lower exposures to lead. This should include research on the effectiveness of strategies applied in the medical office and home and those that provide interventions through medical, public health, and environmental means.

Individual blood lead levels will be compared to the 95<sup>th</sup> percentile level of the 2003-2004 National Health and Nutrition Examination Survey (NHANES) as reported in the *Fourth Report on Human Exposure to Environmental Chemicals* (CDC, 2009). A BLL of 10 µg/dL or greater will be considered a level of concern for participants under the age of 11 and in pregnant women. Recommendations for follow-up will be made, if warranted, including recommendations to reduce potential exposure, repeat testing or consultation with an occupational/environmental physician. ATSDR will provide recommendations for ways to reduce or minimize exposure to lead from soil and other common potential sources.

Should adult non-pregnant participants also be included in the EI, blood lead results will also be compared to those reported in the CDC's *Fourth National Report on Human Exposure to Environmental Chemicals* (CDC, 2009). For non-pregnant adults a health value level of concern for lead has not been established and results will be reported in comparison to the NHANES 95<sup>th</sup> percentile level for lead. Reduction of lead in the U.S. environment has resulted in lowering the overall geometric mean whole blood lead level for the general US population in the past 30 years to less than 2 µg/dL. Recommendations for follow-up will be made, if warranted, including

recommendations to reduce potential exposure, repeat testing or consultation with an occupational/environmental physician.

### **Urinary Arsenic**

The urine samples will be analyzed using published methodologies by the NCEH laboratory. NCEH will analyze the urine samples for total urinary arsenic, speciated urinary arsenic when indicated and creatinine. For methodology see Appendix C of the *Fourth National Report on Human Exposure to Environmental Chemicals* ([http://www.cdc.gov/exposurereport/data\\_tables/appendix\\_c.html](http://www.cdc.gov/exposurereport/data_tables/appendix_c.html)).

In this EI, all urine specimens will be analyzed for total arsenic. If the total arsenic concentration in a specimen is greater than 10µg/L, that sample will be analyzed for inorganic arsenic to determine the sum of urinary inorganic-related arsenic species.

NHANES for the first time provided reference levels for total and speciated arsenic in urine in adults and children 6 years old and older (There are no standard reference levels available for children under 6 years of age.). The 95<sup>th</sup> percentile for the sum of urinary inorganic-related arsenic species in the 2003-2004 NHANES report for children aged 6-11 years was 14.7 µg/L. Speciated urinary arsenic analyses will help to distinguish exposure to inorganic arsenic from the relatively non-toxic form of organic arsenic, which is found in fish, shellfish and to a lesser degree rice. Arsenous (III) acid, arsenic (V) acid, dimethylarsonic acid (DMA) and monomethylarsonic acid (MMA) are the major arsenic species/metabolites found in urine associated with inorganic arsenic. Arsenobetaine and arsenocholine are the predominant arsenic species associated with organic arsenic found in seafood with small amounts of DMA and MMA found. In the 2003-2004 NHANES report, DMA and arsenobetaine were the major contributors to total urinary arsenic levels. If speciated arsenic testing demonstrates the level of inorganic arsenic and associated metabolites in an individual to be 14.7 µg/L or greater, that will be considered an unusual exposure for urinary arsenic for participants of this EI and indicate a need for further investigation to identify possible sources of exposure. For pregnant women (and also adult non-pregnant participants should they be included in the EI) the level of concern for an unusual exposure will also be based on the 95<sup>th</sup> percentile for the sum of urinary inorganic-related arsenic species in the 2003-2004 NHANES report. For persons aged 12-19 years 16.7 µg/L or greater that will be considered an unusual exposure and for persons 20 and older 19.4 µg/L or greater that will be considered an unusual exposure for urinary arsenic.

### **Water Sample for Lead**

The Montana Department of Public Health and Human Services Laboratory will analyze the home tap water specimen for lead concentration. The action level for water samples will be based on the current EPA recommended action level of 0.015 mg/l (15 ppb) as defined in the EPA Lead and Copper Monitoring and Reporting Guidance for Public Water Systems.

## **H. Data management and analysis**

Each participant will be given a unique identifying number. All samples, with their unique identifying number, will be shipped by the ATSDR EI staff directly to the Montana Department of Public Health and Human Services Laboratory for blood and water specimens and to the NCEH Environmental laboratory for urine specimens for analysis. The laboratories will follow their standard procedures for analyzing blood lead, water lead and urinary arsenic levels. Blood lead and water lead results from the Montana Department of Public Health and Human Services Laboratory and urinary arsenic results from the NCEH Environmental laboratory will be electronically transmitted to ATSDR in spreadsheet format. No personal identifiers will be included in the spreadsheet. Data quality assurance and quality control will be performed by the NCEH laboratories. Once all of the data are received, ATSDR will conduct the tabulation and analysis of the data.

Blood lead levels will be reported by grouping blood lead levels in 3 groups, less than 5 µg/dL, 5 µg/dL but less than 10 µg/dL, and 10 µg/dL or greater. Age groups in the EI will be grouped so that they correspond to those found in the *Fourth National Report on Human Exposure to Environmental Chemicals* (CDC, 2009). In addition, pregnant women will be reported as a separate group.

Urinary arsenic levels will be reported in a similar fashion except there will not be any children under the age of 6 tested for urinary arsenic in this EI.

Home tap water sample lead concentrations will be reported in ppb.

## **I. Risks and Benefits of the EI to the Participants**

The only risk to participants of this investigation is a chance of bruising from drawing a blood sample.

The potential benefit to the participants of this EI is that they will learn if they have had elevated levels indicating exposures to lead and arsenic within the past 3 or 4 days prior to testing. If elevated levels are found, appropriate steps to reduce exposure will be taken.

## **J. Notifying the Community of Test Results**

ATSDR will send a letter to each participant of the EI to notify them of their test result. If any of the test results are elevated, ATSDR will make recommendations for how exposures may be reduced. In addition ATSDR staff will be made available to discuss the results by telephone using a telephone number provided to participants in the results letter.

At the conclusion of this investigation, ATSDR will prepare a written report that presents the findings of the EI. This report will contain only aggregate data and will not contain any individual identifiers. The report will be available to federal, state, and local environmental and public health agencies, as well as to the general public.

The consent form will request permission from the participants for ATSDR to share their test

results with other federal and state health and environmental agencies.

### **K. Estimated Timeframe**

ATSDR estimates that the field activities will begin the week of July 12, 2010.

Sampling	Week
1	
Laboratory analysis	Weeks 2-7
Data Evaluation	Weeks 8-11
Notifying individuals of their test results	Weeks 8-9
Writing report and clearance	Weeks 12-19

### **L. Confidentiality**

Confidentiality will be protected to the fullest extent possible by law. Reports produced during this investigation will give only group information and will not identify specific individuals or residences. Individual test results will not be made available to the public, and confidentiality will be protected according to Federal and State laws. Confidential information will be kept in locked cabinets or on password protected computers. At the conclusion of the investigation, ATSDR will prepare a report summarizing the findings of the investigation, but will not reveal personal identifiers.

The informed consent form will request the participants' permission to share the test results with other agencies. Individual test results may be released only to other federal, state, and local public health and environmental agencies. These agencies must also protect this confidential information.

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## **Appendix A**

### **Town of Superior Public Water Supply 2009 Quarterly Report and Documentation of Waiver for Lead and Copper Testing**

**TOWN OF SUPERIOR**  
**Montana Public Water Supply ID number 00339**  
*2009 Water Quality Report*

In compliance with the EPA's Safe Drinking Water Act and in an effort to keep you informed about the quality of water and services we provide to you each day, we're pleased to provide you with our Annual Water Quality Report. This report is a snapshot of the quality of water we provided you last year. It includes details regarding the source of your water, what your water contains and how it compares to EPA and the State of Montana standards.

Our water sources are three wells that draw water from the one hundred and fifty feet deep alluvial aquifer on the south side of the Clark Fork River. Flat Creek Spring has not been used as a source for the public water supply since 1997, due to high levels of antimony. However, gravity flow from the Flat Creek Spring collector could be used as an emergency backup source of water. The wells and spring are connected to a 400,000 gallon reservoir for storage, and the system has a backup generator to maintain the water supply in the event of a loss of power. To ensure its purity, we treat our water with chlorine. We have 411 service connections and have added three new connections this year. We installed approximately 12,000 feet of new water mains, and 6 new hydrants. This was financed by stimulus money, loans and grants.

We want you, our valued customers, to be informed about your water utility. If you want to learn more, please attend any of our regularly scheduled meetings held on the second Monday of each month at 7:30 p.m. at 305 Main Street.

We are pleased to report that our drinking water is safe and meets all federal and state requirements. If you have any questions about this report or concerning your water utility, please contact Roger Wasley or Tony Lapinski at (406) 822-4672. Roger and Tony are our certified operators with 10 years of experience each. They attend periodic training sessions to meet continuing education requirements. The most recent training was in March of 2009 the topics included water and waste water.

**DID YOU KNOW ?** The sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, and wells. As water travels over the surface of land or through the ground it dissolves naturally occurring minerals and in some cases radioactive elements. Water can also pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in water include:

- 1) Microbial contaminants such as viruses and bacteria which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- 2) Inorganic contaminants, such as salts and metals which can be naturally occurring or result from urban storm water runoff, industrial or domestic waste water discharges, oil and gas production, mining and farming.
- 3) Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- 4) Volatile organic chemicals, which are byproducts of industrial processes, petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.
- 5) Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health. The Superior Water System routinely monitors for constituents in your drinking water according to Federal and State laws. We take all of our water samples to Montana Environmental Laboratory in Kalispell (406-755-2131). They are a private laboratory that is certified by the State of Montana and the EPA to analyze drinking water. During the period of January 1 to December 31, 2009, we performed the following tests on our water:

- 24 coliform bacteria tests - all were coliform free.
- 3 Nitrate plus Nitrite tests - results were within EPA guidelines.
- Tests on each of our wells to determine the possible presence of eleven inorganic contaminants - results were within EPA standards.
- Tests on each of our wells to determine the possible presence of 61 organic contaminants - none were detected.
- Tests on each of our wells to determine the possible presence of 40 pesticides & herbicides - none were detected.
- Tests within the distribution system to determine the possible presence of 10 disinfection byproducts - results were within EPA standards.

Due to the non corrosive nature of our water, we have applied for and been granted a monitoring waiver for lead and copper. We will not have to test for these contaminants until the year 2013.

Due to the purity of our water, we have applied for and been issued a reduced monitoring schedule for radiological contaminants. We will not have to test for radiological contaminants until the year 2011.

The Montana Department of Environmental Quality requires that we test for asbestos in our drinking water. As our distribution system contains no asbestos cement pipe, we have applied for and been granted a monitoring waiver for asbestos. We will not have to test for this contaminant until the year 2011.

We treat our system with chlorine and because of this we are required to test for stage one disinfection byproducts such as trihalomethanes and haloacetic acids. Because our levels for these byproducts were less than 50 percent of the maximum contaminant level we have applied for and been granted a reduced monitoring schedule for stage one disinfection byproducts. We will only have to sample for these contaminants every three years.

The following table lists the contaminants detected during recent testing. Some of the data in these tables may be more than one year old, since certain chemical contaminants are monitored less than once per year. Our sampling frequency complies with EPA and state drinking water regulations.

Regulated Contaminants

CONTAMINANT	VIOLATION Y/N	SAMPLE DATE	HIGHEST LEVEL DETECTED	UNIT MEASURE- MENT	MCLG	MCL	LIKELY SOURCE OF CONTAMINATION
Alpha Emitters East - EP505	N	7-30-03	1.1 - 1.6	pCi/L	0	15	Erosion of natural deposits
Barium Middle - EP503 West - EP504	N	10-7-09	0.1 0.1	ppm	2	2	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Nitrate + Nitrite Middle - EP503 West - EP504 East - EP505	N	2-3-09	0.07 0.31 0.13	ppm	10	10	Naturally occurring at this level
Copper	N	8-5-04	90% % is 0.08	ppm	1.3	AL= 1.3	Corrosion of Household plumbing / naturally occurring
Fluoride Middle - EP503 West - EP504 East - EP505	N	10-7-09	0.12 0.11 0.05	ppm	4	4	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
Lead	N	8-5-04	90% % is 3	ppb	0	AL= 15	Corrosion of Household plumbing / naturally occurring
Total Trihalomethanes (TTHM)	N	7-29-09	0.95	ppb	0	80	By product of drinking water chlorination

**DEFINITIONS:**

**MCL - Maximum Contaminant Level** - The "Maximum Allowed" is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**MCLG - Maximum Contaminant Level Goal** - The "Goal" is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**PPM - Parts per million or Milligrams per liter (mg/l)** - one part per million corresponds to one minute in two years or a single penny in \$10,000.

**PPB - Parts per billion or Micrograms per liter** - one part per billion corresponds to one minute in 2,000 years, or a single penny in \$10,000,000.

**AL - Action Level** - the concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

**Pci/L - Pico Curies per Liter** - a very small unit of measurement of radioactivity.

### What does this table tell us?

As you can see our system had no MCL violations. MCL's are set at very stringent levels. To understand the possible health effects of exceeding the MCL, a person would have to drink two liters of water every day at the MCL for a lifetime to have a one in a million chance of having any adverse health effects. Although we have learned through our monitoring and testing that some constituents have been detected, the EPA has determined that your water IS SAFE at these levels.

All sources of drinking water are subject to potential contamination by constituents that are naturally occurring or man made. Those constituents can be microbes, organic or inorganic chemicals, or radioactive materials. All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline at 1-800-426-4791 or online at [www.epa.gov/safewater](http://www.epa.gov/safewater). You can find out more about our system and the specific contaminants we have tested for, on the web at <http://www.deq.mt.gov/wqinfo/pws/reports.asp>.

Lead in drinking water comes primarily from materials and components of the service lines and home plumbing systems. It is possible that lead levels at your home may be higher than other homes in the community as a result of materials used in your home's plumbing. Our water system is responsible for providing high quality drinking water, but we cannot control the variety of materials used in private home plumbing systems. If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. If you are concerned about elevated lead levels in your home's water, you may wish to have your water tested by a certified laboratory like the one we send our samples to (Montana Environmental Laboratory, 406-755-2131). When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap until the water temperature has stabilized (usually for 30 seconds to 2 minutes) before you use the water for drinking or cooking. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure to lead is available from the Safe Drinking Water Hotline 1-800-426-4791, or online at [www.epa.gov/safewater/lead](http://www.epa.gov/safewater/lead).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline. Please call our office if you have questions.

In 2007, the Montana Department of Environmental Quality conducted a source water assessment of our system. This report provides additional information on the potential vulnerability of our wells to contamination. This report is available for review at the Town of Superior City Office. It is also available online at <http://nrjs.state.mt.us/wis/swap/swapquery.asp>. The report can be summarized in the following table:



**Montana Department of  
ENVIRONMENTAL QUALITY**

Brian Schweitzer, Governor

P.O. Box 200901 • Helena, MT 59620-0901 • (406) 444-2544 • [www.deq.mt.gov](http://www.deq.mt.gov)

December 5, 2005

Ms. Brenda Schneider  
Superior, Town of  
P.O. Box 729  
Superior, Montana 59872

RE: Evaluation of Full Waiver Request for Lead and Copper Monitoring for PWS# MT0000339,  
Superior, Town of

Dear Ms. Schneider:

The Department has processed your request for a full waiver under the Montana Lead and Copper Rule as authorized under ARM 17.38.216(3)(o). Based on your latest set of samples and the letter of request dated November 8, 2005, we are happy to grant the full waiver for lead and copper monitoring and assign reduced monitoring to your public water supply.

Your monitoring frequency is now reduced to one sample set (ten sample taps) every nine years. Your next set of samples will be due in the period 2011 to 2013.

If you have questions or need any other materials, please call me at (406) 247-4412.

Sincerely,

Kerry Schmelzer  
Water Quality Specialist  
DEQ, Public Water and Subdivisions Bureau  
Public Water Supply Section  
(406) 247-4412; [kschmelzer@mt.gov](mailto:kschmelzer@mt.gov)

cc: File MT0000339  
LCR waivers

## **Appendix B**

### **Consent/Assent Forms for EI Participants**

**U.S. Department of Health and Human Services (DHHS) Agency for Toxic  
Substances and Disease Registry (ATSDR)**

**Superior, Montana Flat Creek IMM Site**

**Exposure Investigation (EI)**

**Parental Consent Form for Blood Sampling for Lead in Children 9 months  
to 5 years of age**

---

***Who are we  
and why we  
are doing this  
EI?***

- We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency of the Centers for Diseases Control and Prevention (CDC)
- We are doing this EI to determine whether **children 9 months to 5 years** from Superior, Montana have elevated levels of lead in blood
- We are inviting your child/ward to have his/her blood tested for lead

---

***Location for  
the testing***

This testing will take place at the Multipurpose Room, in Superior High School

---

***What is  
involved in  
this EI?***

- **A Blood Test:**
- A 10 ml sample of blood (less than a tablespoon) will be collected from a vein in your child/ward arm
- This will take 5 minutes or less
- **A short questionnaire will be administered**
- This will take 10 minutes

---

***What will  
happen with  
the left over  
blood?***

Any leftover blood will be destroyed and not used for anything else

---

***When will***

You will get your child/ward test results by mail 8-10 weeks after testing

***you get the results?***

---

***What are the Benefits from being in this EI?***

- By being part of this EI, you will find out if your child/ward has a high level of lead in blood
  - There is **NO COST** to you for the testing of your child/ward
- 

***What are the risks of this EI?***

There may be some bruising in the bend of your child/ward elbow where the blood is collected

---

***What about privacy?***

- We will protect your child/ward privacy as much as the law allows
  - We will give your child/ward an identification (ID) number
  - This ID number, not your child/ward name, will go on the blood sample
  - We will not use your child/ward name in any report we write
  - We will keep a record of your child/ward name, address and ID number so that we can send you the blood test result
- 

***When can you ask questions?***

- If you have any questions about this testing, you can ask us now
  - If you have questions later, you can call **Dr. Bruce Tierney at 770-488-0771**
  - Or at the ATSDR **toll free number 1-888-320-5291**
- 

***Parental/  
guardian  
Voluntary  
Consent***

- I agree to have my child/ward tested
  - I and my child/ward have been given the chance to ask questions and feel my questions have been answered
  - I know that having this test done is our choice
  - I know that even though we have agreed to this testing, my child/ward may leave it at any time without penalty
-

**Signature**

I give permission for my child/ward to be tested

\_\_\_\_\_  
Printed name of Child

\_\_\_\_\_  
Signature of Parent/Guardian

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Parent/Guardian

Age of Child \_\_\_\_\_ Gender of Child \_\_\_\_\_

Address of Child \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone \_\_\_\_\_

May we share this test results with other Federal or State Health and Environmental Agencies? YES \_\_\_\_\_, NO \_\_\_\_\_

Lab ID Number \_\_\_\_\_

Certification of Consent Form Administrator:

I have read the consent form to the person name above. He/she has had the opportunity to ask questions about the EI and had the questions answered.

\_\_\_\_\_  
Signature of person administering consent

**U.S. Department of Health and Human Services (DHHS) Agency for Toxic  
Substances and Disease Registry (ATSDR)**

**Superior, Montana Flat Creek IMM Site**

**Exposure Investigation (EI)**

**Parental Consent Form for Blood Sampling for Lead and Urine Sampling  
for Arsenic**

**In Children 6 to 17 years of age**

---

***Who are we  
and why we  
are doing this  
EI?***

- We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency of the Centers for Diseases Control and Prevention (CDC)
- We are doing this EI to determine whether **children 6 to 17 years** of age from Superior, Montana have elevated levels of lead in blood and arsenic in urine
- We are inviting your child/ward to have his/her blood tested for lead and urine for arsenic

---

***Location for  
the testing***

This testing will take place at the Multipurpose Room, in Superior High School

---

***What is  
involved in  
this EI?***

- **Blood Lead Testing:**
- Ten ml sample of blood (less than a tablespoon) will be collected from a vein in your child/ward arm
- This will take 5 minutes
- **Urine Arsenic Testing:**
- On the day of the test, you will help your younger child/ward collect urine at home in a plastic cup we give you
- You will put your child/ward name on the sticker in the side of the cup
- You will help your younger child/ward put the urine cup in a zip lock bag in your refrigerator until you bring it up to an ATSDR person at the Multipurpose Room at Superior High School
- It should take 5 minutes or less for you to help collect your child/ward urine sample

- **A short questionnaire will be administered:**
  - This should take 10 minutes
- 

***What will happen with the leftover blood and urine?***

Any leftover blood and urine will be destroyed and not used for anything else

---

***When will you get the results?***

You will get your child/ward results by mail 8-10 weeks after testing

---

***What are the Benefits from being in this EI?***

- By being part of this EI, you will find out if your child/ward has a high level of lead in blood and arsenic in urine
  - There is **NO COST** to you for the testing of your child/ward
- 

***What are the Risks of this EI?***

There may be some bruising in the bend of your child/ward elbow where the blood is collected

---

***What about privacy?***

- We will protect your child/ward privacy as much as the law allows
  - We will give your child/ward an identification (ID) number
  - This ID number, not your child/ward name, will go on the blood and urine sample
  - We will not use your child/ward name in any report we write
  - We will keep a record of your child/ward name, address and ID number so that we can send you the tests results
- 

***When can you ask questions?***

- If you have any questions about this testing, you can ask us now
- If you have questions later, you can call **Dr. Bruce Tierney at 770-488-0771**
- Or at ATSDR toll free number **1-888-320-5291**

**Parental/  
Guardian  
Voluntary  
Consent**

- I agree to have my child/ward tested
- I and my child/ward have been given the chance to ask questions and feel my questions have been answered
- I know that having these tests done is our choice
- I know that even though we have agreed to these testing, my child/ward may leave it at any time without penalty

**Signature**

I give permission for my child/ward to be tested

Printed name of Child \_\_\_\_\_

Signature of Parent/Guardian \_\_\_\_\_

Date \_\_\_\_\_

Printed Name of Parent/Guardian \_\_\_\_\_

Age of Child \_\_\_\_\_ Gender of Child \_\_\_\_\_

Address of Child \_\_\_\_\_

Telephone \_\_\_\_\_

May we share this test results with other federal or state health and environmental agencies? YES \_\_\_\_\_ NO \_\_\_\_\_

Lab ID Number \_\_\_\_\_

Certification of Consent Form Administrator

I have read the consent form to the person named above. He/she has had the opportunity to ask questions about the EI and had the questions answered.

Signature of person administering consent \_\_\_\_\_

**U.S. Department of Health and Human Services (DHHS) Agency for Toxic  
Substances and Disease Registry (ATSDR)**

**Superior, Montana Flat Creek IMM Site**

**Exposure Investigation (EI)**

**Consent Form for Blood Sampling for Lead and Urine Sampling for Arsenic  
In Pregnant Women Under 18 Years of Age**

---

***Who are we  
and why we  
are doing this  
EI?***

- We are from the Agency for Toxic Substances and Disease Registry (ATSDR)
- We are doing this EI to see if children from 7 to 17 years of age from Superior, Montana have elevated levels of lead in blood and arsenic in urine
- We are inviting you to have your blood tested for lead and urine tested for arsenic

---

***Location for  
the testing***

This testing will take place in the Multipurpose Room in Superior High School

---

***What is  
involved in  
this EI?***

- Blood Lead Testing:
- 10 ml sample of blood (less than a tablespoon) will be collected from a vein in your arm
- This will take 5 minutes
- Urine Arsenic Testing:
- On the day of the test you will collect your urine at home in a plastic cup we give you
- You will put your name on the sticker in the side of the cup
- You will put the sealed plastic cup in a zip lock bag in the refrigerator until you bring it up at an ATSDR person at the Multipurpose Room at the Superior High School
- It should take 5 minutes or less for you to collect your urine sample
- A Short Questionnaire will be administered
- This should take 10 minutes

---

***When will you get the test results?***

You will get your tests results 8 – 10 weeks after testing

---

***What are the Benefits from being in this EI?***

- By being part of this EI, you will find out if you have high levels of lead in blood and arsenic in urine
  - There is NO COST to you for the testing
- 

***What are the Risks of this EI?***

There may be some bruising in the bend of your elbow where the blood is collected

---

***Child Assent***

- Your parent/guardian said it is all right for you to have this blood and urine tests
  - You don't have to do the tests if you don't want to
- 

***What about privacy?***

- We will protect your privacy as much as the law allows
  - We will give you an identification (ID) number
  - This number, not your name, will go on the blood and the urine samples
  - We will not use your name in any report we write
  - We will keep a record of your name, address and ID number so that we can send you the blood and urine tests results
- 

***When can you ask questions?***

- If you have any questions about this testing, you can ask us now
  - If you have any questions later, you can call **Dr. Bruce Tierney** at ATSDR at **770-488-0771**
  - Or at a ATSDR **tool free number 1-888-320-5291**
- 

***Voluntary Consent***

- I agree to be tested
- I have been given the chance to ask questions, and feel that all questions have been answered

- I know that having this tests done is my choice
- I know that even though I agreed to this testing, I may leave it at any time without punishment (or any penalty)

**Signature**

---

I agree to be tested

---

Printed Name of Child

---

Signature of Parent/Guardian

---

Date

---

Printed Name of Parent/Guardian

Age of Child \_\_\_\_\_ Gender of Child \_\_\_\_\_

Address of Child \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_

May we share these tests results with other federal and state environmental agencies? YES \_\_\_\_\_, NO \_\_\_\_\_

Lab ID Number \_\_\_\_\_

Certification of Assent Form Administrator

I have read the assent form to the person named above. He/she has had the opportunity to ask questions about the EI, and had the questions answered.

---

Signature of person administering the assent

**U.S. Department of Health and Human Services (DHHS) Agency for Toxic Substances and Disease Registry (ATSDR)**

**Superior, Montana Flat Creek IMM Site**

**Exposure Investigation (EI)**

**Consent Form for Blood Sampling for Lead and**

**Urine Sampling for Arsenic**

**in Pregnant Women 18 Years of Age and Older**

---

***Who are we and why we are doing this EI?***

- We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency of the Centers for Diseases Control and Prevention (CDC)
- We are doing this EI to find out if **pregnant women 18 years of age and older** from Superior, Montana have elevated levels of lead in blood and arsenic in urine
- We are inviting you to have your blood tested for lead and urine tested for arsenic

---

***Location for the testing***

This testing will take place at the **Multipurpose Room in Superior High School**

---

***What is involved in this EI?***

- **Blood Lead Testing:**
- Ten ml sample of blood (less than a tablespoon) will be collected from a vein in your arm
- This will take 5 minutes or less
- **Urine Arsenic Testing:**
- On the day of the test, you will collect your urine sample at home in a plastic cup we give you
- You will put your name on the sticker in the side of the cup
- You will put the sealed plastic cup in a zip lock bag in the refrigerator until you bring it to an ATSDR person at the Multipurpose Room at the Superior High School
- It should take 5 minutes or less for you to collect your urine sample

- **A short Questionnaire will be administered**
  - This should take 10 minutes
- 

***What will happen with the left over blood?***

Any leftover blood and urine will be destroyed and not used for anything else

---

***When will you get the results?***

You will get your test results by mail 8-10 weeks after testing

---

***What are the Benefits from being in this EI?***

- By being part of this EI, you will find out if you have high level of lead in blood and arsenic in urine
  - There is **NO COST** to you for the testing
- 

***What are the risks of this EI?***

There may be some bruising in the bend of your elbow where the blood is collected

---

***What about privacy?***

- We will protect your privacy as much as the law allows
  - We will give you an identification (ID) number
  - This ID number, not your name, will go on the blood and urine sample
  - We will not use your name in any report we write
  - We will keep a record of your name, address and ID number so that we can send you the blood and urine test result
- 

***When can you ask***

- If you have any questions about this testing, you can ask us now
- If you have questions later, you can call **Dr. Bruce Tierney at**
- **770-488-0771**

questions?

- Or at the ATSDR toll free number 1-888-320-5291

**Voluntary  
Consent**

- I agree to be tested
- I have been given the chance to ask questions and feel my questions have been answered
- I know that having these tests done is my choice
- I know that even though I have agreed to this testing, I may leave it at any time without penalty

**Signature**

I give my permission to be tested

\_\_\_\_\_  
Signature of Person Given Consent

\_\_\_\_\_  
Date

Age \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_

May we share this test results with other federal or state health and environmental agencies? YES \_\_\_\_\_, NO \_\_\_\_\_

Lab ID Number \_\_\_\_\_

Certification of Consent Form Administrator:

I have read the consent form to the person name above. She has had the opportunity to ask questions about the EI and had the questions answered.

\_\_\_\_\_  
Signature of person administering consent

**U.S. Department of Health and Human Services (DHHS) Agency for Toxic Substances and Disease Registry (ATSDR)**

**Superior, Montana Flat Creek IMM Site**

**Exposure Investigation (EI)**

**Consent Form for Blood Sampling for Lead and**

**Urine Sampling for Arsenic**

**in People 18 years of Age and Older**

---

***Who are we and why we are doing this EI?***

- We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency of the Centers for Diseases Control and Prevention (CDC)
- We are doing this EI to find out if **people 18 years of age and older** from Superior, Montana have elevated levels of lead in blood and arsenic in urine
- We are inviting you to have your blood tested for lead and urine tested for arsenic

---

***Location for the testing***

This testing will take place at the **Multipurpose Room in Superior High School**

---

***What is involved in this EI?***

- **Blood Lead Testing:**
- Ten ml sample of blood (less than a tablespoon) will be collected from a vein in your arm
- This will take 5 minutes or less
- **Urine Arsenic Testing:**
- On the day of the test, you will collect your urine sample at home in a plastic cup we give you
- You will put your name on the sticker in the side of the cup
- You will put the sealed plastic cup in a zip lock bag in the refrigerator until you bring it to an ATSDR person at the Multipurpose Room at the Superior High School
- It should take 5 minutes or less for you to collect your urine sample

- **A short Questionnaire will be administered**
  - This should take 10 minutes
- 

***What will happen with the left over blood?***

Any leftover blood and urine will be destroyed and not used for anything else

---

***When will you get the results?***

You will get your test results by mail 8-10 weeks after testing

---

***What are the Benefits from being in this EI?***

- By being part of this EI, you will find out if you have high level of lead in blood and arsenic in urine
  - There is **NO COST** to you for the testing
- 

***What are the risks of this EI?***

There may be some bruising in the bend of your elbow where the blood is collected

---

***What about privacy?***

- We will protect your privacy as much as the law allows
  - We will give you an identification (ID) number
  - This ID number, not your name, will go on the blood and urine sample
  - We will not use your name in any report we write
  - We will keep a record of your name, address and ID number so that we can send you the blood and urine test result
- 

***When can you ask***

- If you have any questions about this testing, you can ask us now
- If you have questions later, you can call **Dr. Bruce Tierney at**
- **770-488-0771**

**questions?**

- Or at the ATSDR toll free number 1-888-320-5291

**Voluntary  
Consent**

- I agree to be tested
- I have been given the chance to ask questions and feel my questions have been answered
- I know that having these tests done is my choice
- I know that even though I have agreed to this testing, I may leave it at any time without penalty

**Signature**

I give my permission to be tested

\_\_\_\_\_  
Signature of Person Given Consent

\_\_\_\_\_  
Date

Age \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_

May we share this test results with other federal or state health and environmental agencies? YES \_\_\_\_\_, NO \_\_\_\_\_

Lab ID Number \_\_\_\_\_

Certification of Consent Form Administrator:

I have read the consent form to the person name above. She has had the opportunity to ask questions about the EI and had the questions answered.

\_\_\_\_\_  
Signature of person administering consent

**U.S. Department of Health and Human Services (DHHS) Agency for Toxic Substances and Disease Registry (ATSDR)**

**Superior, Montana Flat Creek IMM Site**

**Exposure Investigation (EI)**

**Assent Form for Blood Sampling for Lead and Urine Sampling for Arsenic**

**In Children 7 to 17 years of age**

---

***Who are we and why we are doing this EI?***

- We are from the Agency for Toxic Substances and Disease Registry (ATSDR)
- We are doing this EI to see if **children from 7 to 17 years of age** from Superior, Montana have elevated levels of lead in blood and arsenic in urine
- We are inviting you to have your blood tested for lead and urine tested for arsenic

---

***Location for the testing***

This testing will take place in the Multipurpose Room in Superior High School

---

***What is involved in this EI?***

- **Blood Lead Testing:**
- 10 ml sample of blood (less than a tablespoon) will be collected from a vein in your arm
- This will take 5 minutes
- **Urine Arsenic Testing:**
- On the day of the test you will collect your urine at home in a plastic cup we give you
- You will put your name on the sticker in the side of the cup
- You will put the sealed plastic cup in a zip lock bag in the refrigerator until you bring it up at an ATSDR person at the Multipurpose Room at the Superior High School
- It should take 5 minutes or less for you to collect your urine sample
- **A Short Questionnaire will be administered:**
- This should take 10 minutes

***What will happen with the leftover blood and urine?***

- Any leftover blood and urine will be destroyed and not used for anything else
- 

***When will you get the test results?***

You will get your tests results 8 – 10 weeks after testing

---

***What are the Benefits from being in this EI?***

- By being part of this EI, you will find out if you have high levels of lead in blood and arsenic in urine
  - There is **NO COST** to you for the testing
- 

***What are the Risks of this EI?***

There may be some bruising in the bend of your elbow where the blood is collected

---

***Child Assent***

- Your parent/guardian said it is all right for you to have this blood and urine tests
  - You don't have to do the tests if you don't want to
- 

***What about privacy?***

- We will protect your privacy as much as the law allows
  - We will give you an identification (ID) number
  - This number, not your name, will go on the blood and the urine samples
  - We will not use your name in any report we write
  - We will keep a record of your name, address and ID number so that we can send you the blood and urine tests results
-

**When can you ask questions?**

- If you have any questions about this testing, you can ask us now
  - If you have any questions later, you can call **Dr. Bruce Tierney** at ATSDR at **770-488-0771**
  - Or at a ATSDR **tool free number 1-888-320-5291**
- 

**Voluntary Consent**

- I agree to be tested
  - I have been given the chance to ask questions, and feel that all questions have been answered
  - I know that having this tests done is my choice
  - I know that even though I agreed to this testing, I may leave it at any time without punishment (or any penalty)
- 

**Signature**

I agree to be tested

---

Printed Name of Child

---

Signature of Parent/Guardian \_\_\_\_\_ Date \_\_\_\_\_

Printed Name of Parent/Guardian \_\_\_\_\_

Age of Child \_\_\_\_\_ Gender of Child \_\_\_\_\_

Address of Child \_\_\_\_\_  
\_\_\_\_\_

Telephone \_\_\_\_\_

May we share these tests results with other federal and state environmental agencies? YES \_\_\_\_\_, NO \_\_\_\_\_

Lab ID Number \_\_\_\_\_

Certification of Assent Form Administrator

I have read the assent form to the person named above. He/she has had the opportunity to ask questions about the EI, and had the questions answered.

Signature of person administering the assent \_\_\_\_\_

**U.S. Department of Health and Human Services (DHHS) Agency for Toxic Substances and Disease Registry (ATSDR)**

**Superior, Montana Flat Creek IMM Site**

**Exposure Investigation (EI)**

**Consent Form for Environmental Sampling for Tap Water**

---

***Who are we and why we are doing this EI?***

We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency of the Centers for Diseases Control and Prevention (CDC)  
We are doing this EI to determine whether people who live in your neighborhood have been exposed to lead  
The public water supply for Superior, MT has met all federal and state requirements for drinking water in the past to include lead  
While unlikely, it is possible that older plumbing in individual homes could result in the contamination of drinking water with lead in those individual homes

---

***What is involved in this EI?***

We will provide you with a collection bottle and instructions to collect a water sample from your home  
You will bring this sample with you to your EI appointment for testing  
The water sample will be tested for lead by the Montana Department of Public Health and Human Services Laboratory

---

***What are the Benefits from being in this EI?***

By being part of this EI, you will find out if you have high levels of lead in your tap water  
There is NO COST to you for this testing

---

***What are the Risks of this EI?***

There are no risks from this testing

---

***What about my privacy?***

We will protect your privacy as much as the law allows  
We will give your water sample an identification number (ID)  
We will keep a record of your name, address and ID number so that we can send you the water test results

---

***How will I get my water test results?***

The test results and an explanation of what they mean will be mailed to you 6-8 weeks after testing  
We will also give you a telephone number to call if you have any questions

---

***What if I don't want to do this?***

You are free to choose whether or not you want to be part of this testing  
If you agree to do this testing, you can change your mind later and drop out at any time  
You must sign this consent form for your water to be tested

---

***Who do I contact if I have questions?***

If you have any questions about this testing, you can ask us now  
If you have questions later, you can call **Dr. Bruce Tierney at 770-488-0771**

---

***Voluntary Consent***

I have read this form or it has been read to me.  
I have had the chance to ask questions about this testing and my questions have been answered  
I agree to be part of this testing

---

---

Participant's Signature

Date

---

Participant's Printed Name

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone number \_\_\_\_\_

May we share these test results with other federal and state health and environmental agencies YES \_\_\_\_\_, NO \_\_\_\_\_

Lab ID Number \_\_\_\_\_

I have read the consent form to the person named above. He/she has asked questions about the investigation, and had the questions answered.

---

Signature of the person administering consent form

## **Appendix C**

### **Questionnaire for Heavy Metal Exposure for EI Participants**

**Questionnaire for Flat Creek/Superior, MT EI**  
**Individual Questionnaire for Biologic Sampling**

Hello, my name is **SAY NAME**. We are doing an Exposure Investigation for ATSDR. ATSDR is a sister agency to the Centers for Disease Control and Prevention. As part of the investigation, we will be asking you some common questions like your name and address. We will also ask questions on your contact with chemicals. We are asking these questions to better understand all the data we collect.

The questions should take less than 15 minutes. After that, we will be offering free blood and urine sampling for people who live in your home. Once we are done with this investigation, you will be given a copy and details of the Flat Creek/Superior, MT Exposure Investigation test results. Generally, we are able to get results to you within 8-10 Weeks.

**Name of Survey Taker:** \_\_\_\_\_

**Affiliation/Agency:** \_\_\_\_\_

**Phone Number:** \_\_\_\_\_

**Participant ID/Lab Number:** \_\_\_\_\_

**General Information**

First Name: \_\_\_\_\_ MI: \_\_\_\_\_ Last Name: \_\_\_\_\_

Street: \_\_\_\_\_

Apt #: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

**If your mailing address is different from your street address, what is your mailing address?**

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

**How long have you lived at this address?**

Less than 6months

More than 6months, but less than 2 years

More than 2 years, but less than 5 years

More than 6 years, but less than 10 years

More than 10 years

**Please provide a phone number where we can reach you.**

Home: \_\_\_\_\_ Work: \_\_\_\_\_

Cell: \_\_\_\_\_ Other: \_\_\_\_\_

Email: \_\_\_\_\_

**Demographic Questions**

*The next questions are about your own characteristics and will help us compare your test results.*

[Surveyor, please indicate whether the person is a male or female. If this questionnaire is for a minor child, be sure to ask their gender.]

**Gender:**      M      F

**Age:** \_\_\_\_\_

*Indicate age of children under the age of 2 in months*

**What is your ethnicity?**

Hispanic or Latino

Non Hispanic or Non Latino

Don't Know

Refused

**Choose the race that best characterizes you (or your minor child)**

White

Black or African American

Asian

Native Hawaiian or Other Pacific Islander

American Indian or Alaskan Native

Other

---

**Pets**

**Do you have any pets?**

Yes

No

If no, skip next 2 questions

If yes, what types of pets do you have in your home? [List number of pets also]

Pet	Number of Pets
Dog	
Cat	
Other: (list)	

List the number of indoor pets that regularly go outdoors.

---

### House Cleaning Frequency

[In the past 30 days] How often did anyone wet mop (or dust) your home?

Twice a week

Once a week

Less than once a month

Never

[In the past 30 days] How often did anyone dry mop or broom sweep your home?

Twice a week

Once a week

Less than once a month

Never

[In the past 30 days] How often did anyone vacuum your home? [if never go to next section]

Twice a week

Once a week

Less than once a month

Never

Does your vacuum have a bag?

Yes

No  
Don't Know

**Does your vacuum have a high efficiency particulate air (HEPA) filter?**

Yes  
No  
Don't Know

---

## **Garden**

**[In the past 30 days], how often did you work in soil IN YOUR YARD (e.g., gardening, digging, building, repairing)?**

List number of Days \_\_\_\_\_  
Never  
Don't Know

**How often do you eat (seasonal) fruits and vegetables grown in your yard or your neighbor's yard?**

Daily  
Weekly  
Monthly  
Never  
Other \_\_\_\_\_

**How often do you or household member remove shoes before entering your home?**

Never Do This  
Seldom Do This  
Sometimes Do This  
Always Do This

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## **Smoking Questions**

**Are there any smokers in the household?**

Yes

No

---

## Home

**About when was the building built? [How old is the building?]**

*Surveyor: Do not read these categories.*

2000-present

1990-1999

1985-1989

1980-1984

1970-1979

1960-1969

1950-1959

1940-1949

1939 or earlier

Don't Know

**What is your main source of drinking water in your home?**

City or county (public)

Private well

Spring

Pond

Cistern

Community well

Bottled

Filtered

Other Specify: \_\_\_\_\_

Don't know

---

## Hobbies Questions

**Does any household member, including yourself, currently engage in any of the following activities?**

Automotive and electronic repair  
Ceramics making  
Bridge painting and repair  
Building demolition  
Enameling  
Firearms use or repair

Glassblowing  
Herbal remedy ingestion  
Home renovation and repair  
Jewelry making  
Lost wax casting  
Stained glass making  
Any other hobbies that may include lead or arsenic

Yes  
No  
Don't Know

---

**Occupational**

**Do you currently work in any of the following jobs?**

Abrasive Blasting	Mining
Automotive and/or electronic repair	Metal Thermal Spraying Welding
Battery Manufacturing	Metals Recycling
Bridge painting and repair	Painting (Pigments, Binders, and Biocides)
Building demolition	Semiconductor Manufacturing
Firearms use or repair	Silk-Screen Printing
Gas Welding and Cutting	Smelting Copper or Lead
Home renovation and repair	Soldering
Metal Preparation and Pouring	Steel Producing
	Any other jobs that may include lead or arsenic

Yes  
No  
Don't Know

---

**Foods**

Have you eaten seafood (finfish, shellfish like oysters, crabs, mussels, lobster, octopus, squid, seaweed, etc) in the past 3-4 days?

- Yes
- No
- Don't Know

Have you eaten rice in the past 3-4 days?

- Yes
- No
- Don't Know

Have you eaten freshwater fish in the past 3-4 days?

- Yes
- No
- Don't Know

**Is there anything you want us to know that we did not ask about?** [Do you leave your windows open during the year? How often and when (night, day?), Have any of your children or their playmates ever had a high blood lead level?, Do any of your children have developmental delays? Do any of your children display hand-to-mouth behavior, or put non-food items such as paints chips or soil in their mouth?]

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**Thank You!**

## **Appendix C:**

### **Homeowner Tap Water Sample Collection Directions**

## WATER SAMPLING FOR LEAD

### **Suggested Directions for Homeowner Tap Water Sample Collection for the Superior, MT Exposure Investigation**

These samples are being collected to determine the lead levels in your tap water. This sampling effort is part of an Exposure Investigation (EI) being conducted by the Agency for Toxic Substances and Disease Registry (ATSDR) in coordination with the Mineral County health Department. It is being accomplished through the cooperation of homeowners and residents.

A sample is to be collected after water has been sitting in the pipes for an extended period of time (i.e. no water use during this period). Due to this requirement, either early mornings or evenings upon returning from work are the best times for collecting samples. The collection procedure is described in more detail below.

- Participants will be able to pick up a water collection bottle and label from the Mineral County Health Department staff the week prior to the EI to collect a water sample. They should collect the sample the morning of their scheduled EI appointment and should bring the sample with them to their appointment at the Superior High School for collection by ATSDR staff.
- A minimum of 6 hours before the sample collection, run the cold water faucet until water temperature changes. This is best done just prior to going to bed at night or just before leaving for work in the morning (if no one else will be in the house during the day).
- A minimum 6 hour period during which there is no water use throughout the house must be achieved prior to sampling. Early evenings or mornings are the best sampling times to ensure that the necessary stagnant water conditions exist. Try not to sample from taps that have had water sitting stagnant for more than 18 hours.
- A kitchen or bathroom **cold** water faucet is to be used for sampling. Place the open sample bottle below the faucet and gently open the cold water tap. Fill the sample bottle to the line marked “1000 ml” and turn off the water.
- Tightly cap the sample bottle and place it in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
- Bring the water sample bottle with you to your scheduled EI appointment to be tested.
- ATSDR will provide individual results from this sampling effort only to the individual EI participants who provided the sample.

Contact the ATSDR Information Line at **1-888-320-5291** or the Mineral County Health Department at **406-822-3564** if you have any questions regarding these instructions.