Iron King Mine / Humboldt Smelter Superfund Site

U.S. Environmental Protection Agency • Region 9 • San Francisco, CA • November 2013

EPA to Conduct Field Work to Complete Cleanup Investigation; New Information About Residential Background and Soils

The purpose of this fact sheet is to share developments related to the Iron King Mine / Humboldt Smelter Superfund Site (Site). The United States Environmental Protection Agency (EPA) will be performing major field investigation work over the next several months. EPA also has new information to share with you about arsenic and lead soil levels in residential yards from both natural and Site sources, and what levels may pose a health concern. All are invited to a public seminar-style meeting on Saturday, December 7, 2013 (see box to right).

The Superfund process allows EPA to investigate, evaluate cleanup alternatives, and perform cleanup actions at contaminated sites. EPA is required to select a long-term remedy for the Site contamination that protects human health and the environment.

What Were the Sources of the Contamination at the Site?

There are two major contributors to contamination at the Iron King Mine / Humboldt Smelter Site (Figure 1 shows an overview of the Site). First, operators of the **Iron King Mine** extracted, milled and concentrated solid rock ores for lead, zinc, copper, gold, and silver between about 1934 and 1970. Smaller mining facilities operated between 1906 and 1934. Second, after small-scale operations in the late 1800s, the **Humboldt Smelter** purified copper from mine ores between 1906 and about 1937. Most production took place during World War I. Later, in the 1950s and 1960s, small processing operations attempted to recover metals from materials brought to the old smelter property. The contamination that remains today is from these historical operations.

The U.S. EPA Presents

Public Meeting and Open House

Saturday, December 7, 2013
12:30 – 5:30 PM

Humboldt Elementary School Gymnasium

Open House Discussion Tables All Day

Plus

These Scheduled Presentations:

12:30 Introductions and Orientation to the Day

Superfund Site Work and Cleanup Process (EPA)

1:00 Upcoming EPA Field Work to Complete the Cleanup Investigation

2:00 Residential Yards: Area Impacted by the Site; Background, and Levels of Concern for Soils *[New Info!]*

Understanding and Reducing Your Exposure to Arsenic and Lead in the Humboldt Area
(ATSDR, ADEQ, ADHS, University of Arizona SRP, EPA)*

3:30 Drinking Water from Public and Private Well Systems

4:30 Gardening, Soils, Dust, and Recent Blood and Urine Testing

**Agency for Toxic Substances and Disease Registry, Arizona Department of Environmental Quality, Arizona Department of Health Services, University of Arizona Superfund Research Program*

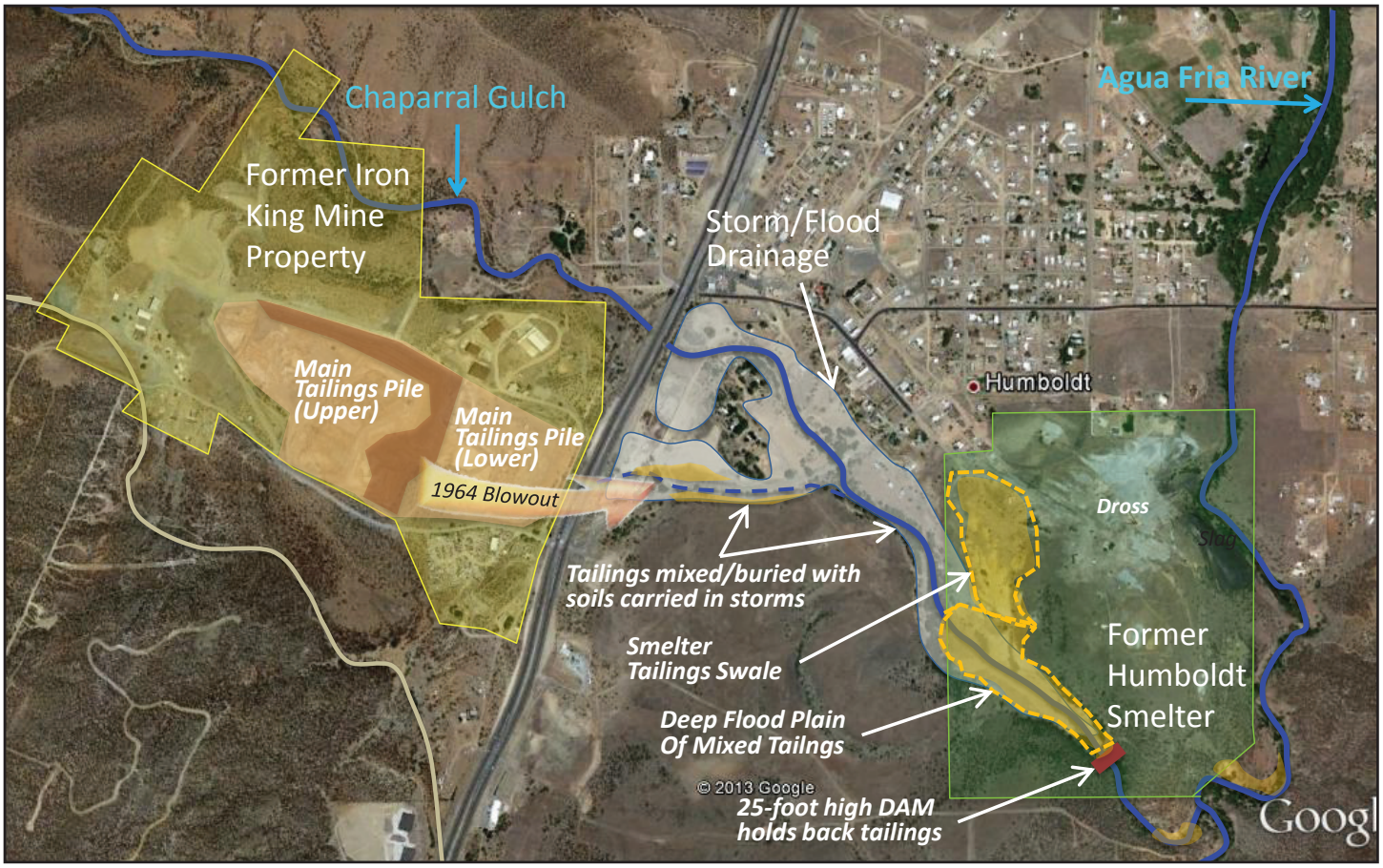

Figure1. Source Areas of the Iron King/Humboldt Smelter Superfund Site

Where is the Waste Contamination On and Near the Mine and Smelter?

A 4-million cubic-yard tailings pile remains at the Iron King Mine property. *Tailings* are wastes left over after saleable metals are removed from mined ore during processing. The tailings contain high levels of arsenic and lead. These metals can be toxic to humans and wildlife and can be found in soils, dissolved in water, and in some cases absorbed into plants. The slopes of the tailings pile are too steep for long-term stability. In about 1964, part of the pile collapsed. Mine pile tailings flowed into the Chaparral Gulch, passed downstream and mixed with tailings from the Humboldt Smelter. There are braids of mostly buried contaminated tailings in the Gulch up and downstream of 3rd Street. These contaminants move and mix with sediments from the mountains during heavy rains.

The Humboldt Smelter dumped tailings into a wide swale, or depression in the land, and into an expansive flood plain in the Chaparral Gulch. Today, the tailings are held back by a 25-foot concrete dam downstream of the former smelter. The dam is wedged in a narrow canyon upstream of the Agua Fria River. The extensive tailings are heavily contaminated with arsenic and lead.

Under certain conditions and over many years, tailings piles can cause a phenomenon called *acid rock drainage* which has the potential to allow toxic metals to contaminate surface water and groundwater. Preventing and controlling this is one focus of EPA's investigation and evaluation of cleanup alternatives.

In addition, a fine, grayish material called *aluminum dross* was crushed above the Gulch on the former smelter property, most likely in the 1950s with the intention of recovering saleable aluminum. The dross remains today and contains elevated levels of lead.

What Field Work is EPA Planning On and Near the Mine and Smelter?

Between November 2013 and late spring of 2014, EPA and several of its contractors will be conducting an extensive field investigation at the mine tailings pile, the Chaparral Gulch, smelter, smelter flood plain, and the dam. You will see field crews, and both large and small truck-mounted drilling equipment. This field work will include drilling and sampling from over 100 borings and probes, and 11 groundwater monitoring wells at depths ranging from 6 to 125 feet. Determining the depth and volume of the tailings and dross throughout the Chaparral Gulch and smelter property is needed to evaluate cleanup options. The sampling will provide a better understanding of the extent of the tailings, their stability, the potential for acid mine drainage, etc. These activities will supplement sampling investigation activities conducted by EPA in previous years.

What Field Work is EPA Planning in Residential Yards?

EPA is also investigating whether levels of metals in the soils in residential yards may have become elevated by blowing tailings in the past, or by smoke stack emissions from the smelter more than 75 years ago. Tailings also were sometimes used as fill material in a few yards before it was known that this use could be hazardous.

In 2009 and 2010, EPA conducted sampling of soils in almost 200 residential yards near the mine and smelter. In the last two years, EPA also conducted an extensive background investigation. EPA plans to conduct additional sampling at a few hundred remaining yards within the **Area of Potential Site Impact (APSI),** shown in Figure 2, in the next four months. If your yard is to be sampled, EPA or its contractors will contact you seeking access to your property for sampling. Typically 10-15 samples will be collected from soils in your yard. The sampling results will allow EPA to determine where cleanup is necessary for residential yards. If you have questions about this sampling, please call one of the EPA representatives noted on the bottom of this fact sheet.

Why is Background Important When Thinking About Arsenic in Residential Soil?

Arsenic is present naturally in soils in the Dewey-Humboldt area at higher levels than in most other areas of the country (though the arsenic levels span a wide range). This *background* arsenic would be present even if the mine and smelter had never existed due to the geology in the area. Because background levels of arsenic are naturally high, EPA must determine which arsenic in residential soil samples is natural and which is from the Site.

The Superfund law provides EPA authority to conduct cleanup actions for Site-related contamination, but not for background contamination. Residents living in locations with elevated background arsenic, as well as those living in areas with Site-related arsenic can take simple steps to reduce their exposures to this contaminant. These will be discussed in the December 7 meeting and are summarized at the end of this fact sheet.

Figure 2. The APSI, Area of Potential Site Impact

What are the Background Levels for Residential Soils? Where Has the Site Affected Soil?

In 2012-2013, EPA conducted an extensive investigation of background metals in soils in the Dewey-Humboldt area. Undisturbed soils were sampled at more than 400 locations at distances of up to three miles from the Site sources. This large number of well-spread samples has significantly improved EPA's ability to determine where Site-related contamination exists in the area.

The metals that may pose a health risk at the Site are arsenic and lead. EPA found that arsenic is widespread and levels vary over a wide range. In contrast, lead is typically present at much lower levels than arsenic and elevated levels are typically limited to locations much closer to the Site sources.

EPA used two techniques to evaluate background. First, the surface arsenic levels were compared to 1-foot deep arsenic levels in undisturbed soils. These two results will be similar in background areas, while in Site-affected areas the surface soils will be higher. This comparison must be performed using mathematical statistics.

Second, the ores from the mine and smelter have significant levels of zinc and copper, but (unlike arsenic) the natural geology in the area does not. This means that zinc and copper can be used as *indicators* for where Site contamination may have arrived, even though zinc and copper themselves are not typically toxic.

In order to tell which soils have only naturally occurring metals, and which have metals contaminated by the Site, EPA has calculated *background threshold values* for arsenic, lead, zinc, and copper. See the box to the right for a description of these. EPA also has identified the Area of Potential Site Impact (APSI), shown in the Figure 2. In the area outside of the APSI boundary, the data indicate that Site sources have not had an impact on soils, and arsenic and lead levels can be attributed to natural geology of the area. EPA is only planning to conduct additional sampling in yards inside the APSI boundary. The soils in these yards do **not** necessarily pose a health risk. Rather, EPA will be conducting additional sampling to evaluate these yards in the next few months.

Background Threshold Values* for Four Key Metals at the IKHS Site

Arsenic.....112 mg/kg
Lead.....35 mg/kg
Zinc.....136 mg/kg
Copper.....182 mg/kg

In the Dewey-Humboldt area, natural geology alone (background) would not be expected to cause soil levels higher than these values.

The amount of a metal in soil is usually measured as the milligrams of a metal in each kilogram of soil (mg/kg).

*For statisticians, these values are 95/95 Upper Tolerance Limits, or UTLs.

What are the Levels of Health Concern for Arsenic in Residential Soils?

A person can be exposed to contaminants through ingestion of soil or dust, drinking water, inhalation, skin absorption, ingestion of contaminated food and other means. Whether a person is *actually* exposed to contaminants and to how much depends not only on the levels of contaminants in soil, water or food, but also a person's individual activities and consumption. EPA is evaluating the potential for contamination to affect the health of those living in the Dewey-Humboldt area. When making evaluations, EPA determines what will be protective of human health over a period of decades. EPA studies what levels of a chemical may pose a health concern and then uses this information to make cleanup decisions.

EPA defines a range of contaminant levels that is protective of health for those living in the area, called a low risk range. When soil levels are in this range, EPA considers the health risk very low even for persons exposed to the soils for many decades. For arsenic in yard soils at this Site, EPA has tentatively calculated this range to be **up to 145 mg/kg** (milligrams of arsenic in each kilogram of soil). For persons regularly exposed for many years to arsenic in soils at average levels above 145 mg/kg, EPA may consider the health risk elevated. This low risk range could be different at this Site than at other sites in the U.S. You should note that in some parts of the Dewey-Humboldt area, even naturally-occurring arsenic levels can pose an elevated health risk over a long period of time.

EPA's tentative Low Risk Range for arsenic levels in soil, specific to this site:

Up to 145 mg/kg

This is based on an arsenic bioavailability of 20%. EPA is still studying the arsenic bioavailability, which might be as much as 60%. If it were 60%, the low risk range would change to be up to 61 mg/kg.

The low risk range is affected by something called *arsenic bioavailability*. This refers to the percentage of arsenic that actually remains in the body after it is ingested. When calculating the risk range shown above, EPA used an arsenic

bioavailability of 20%. This is based on the best data available now. EPA is conducting further tests on bioavailability in residential soils in the area over the next six months, and will determine a final bioavailability value before making decisions about cleanup. EPA will keep the community informed of the latest findings.

Regardless of where arsenic or lead may come from, steps that you can take to reduce your exposure to arsenic in this area are summarized at the end of this fact sheet and will be discussed in detail at the December 7 meeting.

What is Arsenic Bioavailability?

The percentage of arsenic that actually remains in the body after it is ingested. The rest of the arsenic is excreted. The lower the bioavailability, the lower the possible toxicity of the arsenic.

Reduce Your Arsenic Exposure

Naturally-occurring arsenic in soils in the Dewey-Humboldt area are higher than in most other parts of the country, and the arsenic levels span a wide range. Some areas also have Superfund site-related contamination. Several agencies will join EPA at the December 7 public meeting at Humboldt Elementary School to discuss simple steps you can take to help reduce your exposure to arsenic. They will also discuss studies about exposure to metals in the Dewey-Humboldt area that are ongoing.

Here is a short list of some actions that you can consider to reduce exposure. *These are practices we recommend to everyone in the Dewey-Humboldt area, regardless of whether you live near the Superfund site.*

- **Get your tap water tested for arsenic and lead if you have a private well.** In some locations, groundwater in the Dewey-Humboldt area contains arsenic and other contaminants at levels above the drinking water standards. The intake for private wells can lie close to locations of naturally occurring arsenic in rock. The EPA drinking water standard for arsenic is 10 micrograms per liter. To discuss how often to test your well water and for which contaminants, contact the Arizona Department of Health Services (ADHS) at (602) 364-3128. For help finding a water laboratory, contact the ADHS laboratory at (602) 364-0728.
- **If your private well water has arsenic levels above 10 micrograms per liter, consider installing an in-home water treatment system.** Some filters and systems are much less effective than others. At the December 7 public meeting, the University of Arizona will have information available on effective treatment systems.
- **If you are connected to the public drinking water system, note that the water provider is required to meet state and federal drinking water standards.** Residents with questions or concerns should contact Humboldt Water System directly or Arizona Department of Environmental Quality at (602) 771-4641.
- **Remove your shoes before entering the house.** Dust from outside can be tracked in on your shoes and lodge in carpets and upholstery in small amounts that add up over time.
- **Have your house heating/cooling ducts professionally cleaned regularly**. This will minimize soils and dust from the outside that can collect in ducts.
- **Wash your hands and your children's hands before eating**. This will ensure that soils or dust on your hands do not get on your food or directly into your mouth.
- **Wash your homegrown vegetables and fruit before eating**. This will ensure that you do not consume any loose soils that may be clinging to the food.
- **Practice smart gardening.** Lettuce, radishes, broccoli, brussel sprouts, kale, and cabbage accumulate more arsenic from soils than other garden plants. Consider eating a limited amount of these vegetables from local gardens.
- **Have your children's blood tested for lead.** All children in the United States should have their blood tested for lead at age 1, and again at age 2, at a minimum.

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Contact Information

If you have questions or concerns, please contact any of the following individuals:

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Information Repository

For site documents, please visit the information repository at:

Dewey-Humboldt Town Library
2735 S. Corral Street
Dewey-Humboldt, AZ

Please visit EPA's and ADEQ's Iron King Mine and Humboldt Smelter site websites at:

http://www.epa.gov/region09/ironkingmine

http://www.azdeq.gov/environ/waste/sps/statesites.html#ironking