Some of the Reasons Why Cleanup Levels Differ Between Anaconda and Butte, Montana

Cleanup levels for Superfund remediation in Anaconda and Butte are based on human health risk assessments, multiple bioavailability studies, and the unique contamination conditions in the two towns. The following highlights explain why cleanup levels differ between Anaconda and Butte.

Different Contamination Sources

ANACONDA Contamination was imported from Butte as ore for smelting. Smelting was large scale for almost a century.

BUTTE Contamination is local. An ore body underlies the town. Smelting was small scale for a few decades.

- **Anaconda:** There is no underlying ore body to add contamination. Mining-related* lead contamination comes from ore that was mined in Butte and shipped to Anaconda for smelting. The giant Anaconda Smelter operated for almost a century and dispersed smelter emissions by air over hundreds of miles.
- **Butte:** Mining-related lead contamination comes from processing the lead-containing ore that exists below Butte, from disposing of mine waste materials in dumps and piles on the surface, and from using the waste as backfill. Smelting occurred on a smaller scale but ended with the construction of the Anaconda Smelter. Smelter emissions in Butte were generally not widespread, and the overall contaminant footprint from smelting is limited in comparison to Anaconda.

Different Contaminant Drivers Identified for Cleanup

A site may have several contaminants of concern, but cleanup is often driven by only a few. Focusing cleanup on the primary contaminant of concern will usually also address secondary contaminants at the same time.

ANACONDA Arsenic is the primary driver for cleanup.

BUTTE Lead is the primary driver for cleanup.

- **Anaconda:** The primary concern with smelter emissions was arsenic so arsenic is the primary driver for cleanup in Anaconda. Lead was added as an additional contaminant of interest in 2013 based on sampling that showed elevated lead concentrations in some areas where smelter wastes were generated, handled, or transported.
- **Butte:** Lead is the primary driver for cleanup in Butte. Arsenic and mercury are also contaminants of concern and have soil cleanup levels, but they are secondary drivers to lead.

Different Contaminants Originally Evaluated for Bioavailability

Risk-based soil cleanup levels incorporate information on bioavailability (see the Frequently Asked Questions on the reverse page for more information on bioavailability). Cleanup levels can either use default or site-specific bioavailability values.

ANACONDA Site-specific cleanup levels were calculated for arsenic.

BUTTE Site-specific cleanup levels were calculated for lead.

- **Anaconda:** Studies were conducted to determine the site-specific bioavailability of arsenic in smelter-impacted soil and dust in Anaconda. The site-specific residential soil cleanup level for arsenic is 250 parts per million (ppm) and includes site-specific arsenic bioavailability adjustments. When a lead cleanup level was added in 2013, the EPA default residential soil screening level (400 ppm) was selected. This choice was supported by site-specific laboratory bioavailability testing for lead.
- **Butte:** Studies were conducted to determine the site-specific bioavailability of lead in mining-impacted soils and waste materials in Butte. The site-specific residential soil cleanup level for lead is 1,200 ppm and includes site-specific lead bioavailability adjustments. The site-specific residential arsenic soil cleanup level calculated for Anaconda (250 ppm) was adopted for use in Butte.

Different Remedial Program Objectives

ANACONDA On-demand blood lead testing with associated removals, where needed.

BUTTE Large-scale blood lead testing and residential assessment/ abatement.

- **Anaconda:** The county's Community Protective Measures Program (CPMP) is in the process of initiating a blood lead monitoring program, available to all residents within the Superfund Overlay.
- **Butte:** The Residential Metals Abatement Program (RMAP) is a multi-pathway program that has operated as the RMAP since 2006 and under a different name before 2006. The RMAP allows the county to address the various pathways of lead contamination that may be hazardous to human health. The RMAP has been an important community-wide mechanism for identifying and reducing lead exposures from a variety of sources. Blood lead monitoring data show that the RMAP has been effective in lowering lead exposures in Butte.

**Other sources of lead not associated with mining activities include lead paint, lead piping, cosmetics, and ceramic glazes. A more comprehensive list of products containing lead is available at: www.cdc.gov/nceh/lead/prevention/sources.htm*

Frequently Asked Questions on Bioavailability and the Risk from Lead in Butte

What is bioavailability?

Absolute bioavailability (ABA) is a measure of what fraction of an ingested chemical dose enters the bloodstream.

What is EPA's default bioavailability percentage for lead?

Lead is present in many chemical forms in soil depending on its source. Some forms are more bioavailable than others. The EPA default ABA value for residential children exposed to lead in soil is 30%. This equates to a relative bioavailability (RBA) of 60%, as ABA is roughly half of RBA.

Why perform a bioavailability study?

EPA has developed default screening levels for various compounds and elements for use at Superfund sites. However, site-specific cleanup levels are often derived to consider site bioavailability conditions and ensure cleanup is protective. Bioavailability studies are generally performed for lead and arsenic when there is information to suggest that the chemical form of the contaminant at the site makes it less bioavailable than the default assumption. Today, bioavailability studies for arsenic and lead can be done using specialized laboratory analysis without involving animals.

Consider the Cookie

Here is an imperfect but potentially useful illustration of bioavailability.

Cookie A is sweetened with table sugar and is **250 calories**.

Cookie B is sweetened with a synthetic sweetener and is **125 calories**.

Both cookies look and taste the same, but the **different chemical composition** of the artificial sweetener means that **you can eat twice as many low-calorie cookies** compared to the high-calorie cookies.

The lead in Butte is less bioavailable, so it is similar to the low-calorie cookie. It takes more Butte soil to reach the allowable number of "lead calories" compared to sites where lead bioavailability is higher.

How are bioavailability results used?

The human health risk assessment uses site-specific lead ABA in the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) model. The model can calculate the level of lead in soils that assures an exposed child would not result in a blood lead level greater than a target threshold. In Butte, the site-specific ABA for lead is 10 to 12% depending on the study used, which is roughly one-third of the default ABA for lead.

How do we know that the site-specific cleanup level for lead is protective?

The *2014 Butte Priority Soils Operable Unit, Public Health Study, Phase 1*, reported that average values of blood lead levels for children tested in 2010 were less than half of those from 2003. Geometric means (or averages) declined from 3.5 micrograms per deciliter (µg/dL) in 2003 to 1.6 µg/dL in 2010, and the percent of blood lead levels above 10.0 µg/dL fell by a similar magnitude. The percent of blood lead levels above 5.0 µg/dL declined by an even greater margin, decreasing from 33.6% in 2003, to 9.5% in 2010. This shows that soil cleanup levels and the RMAP have been effective in reducing blood lead levels in Butte.

Why the focus on young children and pregnant mothers? Aren't you concerned about older children and adults?

Concern over health effects from elevated lead levels is greatest for young children and the developing fetuses of pregnant women. Reasons for the focus on this population include:

- Young children typically have higher exposures to lead contamination than older kids and adults
- Young children typically absorb more lead than older kids and adults
- The developing bodies of young children and fetuses are more susceptible to effects of lead than older kids and adults

EPA cares about all members of the community. Our focus on the most vulnerable ensures that other populations are also protected.

If you have questions, please contact any of the following EPA team members:

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This fact sheet was developed by EPA as part of our efforts to address environmental justice in Butte, Montana.