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COLORADO
Hazardous Materials & Waste Management Division
Department of Public Health & Environment

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Colorado Smelter Superfund Site Pueblo, Colorado

EPA ID: CON000802700

Early Interim Action Residential Property Cleanups Operable Unit 1 – Community Properties Record of Decision September 2017

U.S. Environmental Protection Agency, Region 8
1595 Wynkoop Street
Denver Colorado 80202-1129

EARLY INTERIM ACTION RESIDENTIAL PROPERTY CLEANUPS OPERABLE UNIT 1 – COMMUNITY PROPERTIES

RECORD OF DECISION DECLARATION

Site Name and Location

The Colorado Smelter Superfund Site ("Colorado Smelter Site" or "Site") is located in south central Pueblo, Colorado and includes the historic Colorado Smelter, previously owned and operated by the American Smelting and Refining Company (ASARCO), and residential, commercial, school district, and City owned properties within a one-half mile radius of the former smelter.

The historic Colorado Smelter footprint (Operable Unit 2 [OU2]) consists of an approximately 700,000 square-foot (16-acres) slag pile and several more acres of active commercial businesses that overlie the former smelter footprint and is located south of the Arkansas River, west of Santa Fe Avenue, north of Mesa Avenue and east of Interstate 25 (Figure 2 in the Appendix). The Colorado Smelter operated from 1883 to 1908, and portions of the facility's foundation and waste piles are still present.

The Site comprises two operable units: OU1, Community Properties, and OU2, the Former Smelter Area. OU1, the focus of this early interim action, consists of a preliminary study area based on a one-half mile radius surrounding the former smelter stack location on OU2. Within OU1, there are approximately 1,900 homes and another 400 parcels that include vacant properties, commercial businesses, schools, parks and city-owned alleys within the OU1 study area. The neighborhoods that are adjacent to the former Colorado Smelter historical footprint and most impacted by Site contaminants are the Bessemer, Eilers, and Grove neighborhoods. This Early Interim Action Record of Decision (i-ROD) addresses only residential property cleanups within OU1.

Statement of Basis and Purpose

This interim decision document presents the selected early interim action remedy for lead and arsenic contaminated residential properties within OU1 of the Colorado Smelter Site. This i-ROD has been developed in accordance with the requirements of the Comprehensive, Environmental Response, Compensation and Liability Act (CERCLA) of 1980, 42 U.S. Code (USC) §9601 et seq. as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record for this OU1 early interim action for the Site. The Administrative Record for this action is located at the following information repositories:

Pueblo City County Library Rawlings (Main Branch) 100 E. Abriendo Avenue Pueblo, CO 81004 719-562-5600	EPA Region 8 Superfund Records Center 1595 Wynkoop Street Denver, CO 80202-1129

The US Environmental Protection Agency (EPA) Site Identification Number is CON000802700.

The Colorado Department of Public Health and Environment (CDPHE) participated in the development of the remedy selected by the EPA Region 8 and CDPHE concurs with the selected remedy.

Assessment of the Site

In 2011, an EPA and CDPHE (State health department) site assessment found elevated levels of lead and arsenic in residential soils and large slag piles at the Site. These results indicated that comprehensive sampling and cleanup was necessary to more fully characterize the contamination and reduce health risks for current and future residents. On May 12, 2014, EPA proposed adding the former Colorado Smelter to the National Priorities List (NPL) of Superfund sites. The NPL is the list of sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation. On December 11, 2014, EPA listed the Site on the NPL (79 F.R. 2014-28979).

The response actions selected in this i-ROD are necessary to protect the public health or welfare or the environment from risks associated with actual or threatened releases of hazardous substances from the historic smelter emissions into the environment at the Site. Such release or threat of release may present an imminent and substantial endangerment to public health or welfare.

Description of the Selected Remedy

This selected remedy, Alternative 3, addresses risks to human health associated with smelter-related lead and arsenic contamination in residential properties within OU1 of the Colorado Smelter Site. The remedy was chosen to address elevated levels of metals in outdoor soil and indoor dust that require cleanup prior to completion of the overall Site remedial investigation (RI). The major components of the selected remedy include the following actions:

- Removal of soils from residential areas where contamination exceeds the lead and arsenic cleanup levels.
- Visible barrier/marker material placement where soil contamination that exceeds the cleanup levels is left in place below the depth of the excavation (e.g., 18 or 24 inches).
- Replacement of excavated soil with clean soil and restoration of the remediated areas.
- Offsite transport, and disposal of contaminated soils in compliance with all applicable Federal and State requirements.
- Indoor cleaning of contaminated surfaces, or removal and replacement of carpeting in living spaces that the EPA has determined contain historic smelter-related contaminants at concentrations above the cleanup levels that cannot be cleaned using the high-efficiency particulate air (HEPA) filter vacuum methods. This component would not include remediation or encapsulation of lead-containing interior paint and lacquers that EPA does not have the authority to clean up.
- Sampling of soil at the final excavation depth (e.g., 18 or 24 inches), to determine if institutional controls (ICs) will be necessary as part of the final residential soils remedy.
- Issuing cleanup completion letters to property owners and residents describing the work done, whether any soil contamination exceeding the cleanup levels was left in place for any portion of the yard, the yard restoration requirements and warranty period for new grass, trees, shrubs, other vegetation and landscaping materials, and recommendations or requirements, if needed, to maintain long-term protectiveness of the cleanup.
- EPA will monitor yards when cleanups are complete for a minimum of one year to ensure compliance with the restoration requirements and warranty.
- If contaminated soil is left in place above levels considered acceptable for unlimited use and unrestricted exposure, EPA will conduct five-year reviews in cooperation with the State to evaluate the long-term effectiveness of the cleanup.
- ICs will be needed for properties where contaminated soil is left in place above levels safe for unlimited use and unrestricted exposure. Although the need for ICs at specific properties and what kind of ICs may be needed will be evaluated, the public will have an opportunity to review and

comment on that portion of the remedy as part of the final Record of Decision (ROD) for OU1. Institutional controls developed for OU1 will comply with the Colorado Environmental Covenant Statute, C.R.S. §§ 25-15-317 et seq.

- In many cases, indoor lead dust cleanups will take place in coordination with a soil cleanup; however, a small percentage of homes that receive indoor dust cleanups will not require outdoor soil cleanups because arsenic and lead in soils do not exceed the soil cleanup levels. People generally spend a significant percentage of their time indoors, so the overall risk of exposure to smelter-related contamination may be higher in some homes from dust than from soil.

Statutory Determinations

This early interim action is protective of human health and the environment prior to EPA issuing a final Site-wide ROD. The interim action remedy complies with Federal and State requirements that are applicable or relevant and appropriate for this limited-scope action; is cost-effective, and utilizes permanent solutions to the maximum extent practicable. This action is considered an early interim action because the OU1 RI is not complete; however, it will utilize permanent solutions for soil and dust cleanups and is consistent with the anticipated final remedy for OU1.

Alternative treatments such as phosphate amendments were considered, but eliminated due to technical limitations and the presence of both lead and arsenic in soil. Treatment of the soil lead in the residential areas was also found to be not practicable or cost effective. Therefore, a treatment remedy would not satisfy the statutory preference for treatment as a principal remedy element for this early interim remedy for residential properties in OU1. Since this action does not employ treatment that reduces the toxicity, mobility, or volume of hazardous substances, the statutory preference for treatment is not met.

The selected soil and dust cleanup levels provide long-term protectiveness and therefore are expected to be unchanged in the final OU1 ROD. Although residential soils and dust cleanups will be considered complete and, under most circumstances, will allow for unlimited use/unrestricted exposure (UU/UE), there may be locations where this early interim action remedy will leave contaminated soil, that is, hazardous substances remaining on-site above health-based levels. Such locations may include those where:

- Sampling and cleanup leave contamination in place at levels above UU/UE;
- Sampling was conducted and a cleanup is needed, however, consent for cleanup was not granted by the property owner; and
- The property owner did not provide consent for sampling.

If hazardous substances remain on-site, a statutory review of the remedy will be conducted every five years to ensure that it continues to provide adequate protection of human health and the environment. Remedy reviews will begin within five years after the interim remedial action begins (NCP §300.430(f)(4)(ii)).

Early Interim Action ROD Data Certification Checklist

The following information is included in the Decision Summary section of this i-ROD. Additional information supporting EPA’s decision can be found in the Administrative Record for this Site.

- Contaminants of Concern (COCs) for this early interim action and their respective concentrations. (Section 5 and Section 7)
- Interim risk represented by the COCs. (Section 7)
- Cleanup levels established for COCs and the basis for those levels. (Section 7)
- Whether source materials constituting principal threats are found at the Site and, if so, how the remedy will address them. (Section 11)

- Current and reasonably anticipated future land use assumptions and ground water use assumptions used in the baseline risk assessment and i-ROD. (Section 6)
- Potential land and ground water use that will be available at the Site as a result of the selected remedy. (Section 12)
- Estimated capital, annual operation and maintenance (O&M) costs, total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected. (Section 12)
- Key factors that led to selecting the remedy. (Section 12).

Authorizing Signatures

Federal

This Early Interim Action Record of Decision documents the selected remedy to address smelter-related contamination in residential soil and indoor dust at OU1 of the Colorado Smelter Site.

The following authorized official at EPA Region 8 approves the selected remedy as described in this i-ROD.

Betsy Smidinger
Betsy Smidinger
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

9/25/17
Date

Authorizing Signatures

State of Colorado

This Early Interim Action Record of Decision documents the selected remedy to address smelter-related contamination in residential soil and indoor dust at OU1 of the Colorado Smelter Site.

The following authorized official at the Colorado Department of Public Health and Environment approves the selected remedy as described in this i-ROD.

Larry Wolk, MD, MSPH Executive Director and Chief Medical Officer Colorado Department of Public Health and Environment	9/26/17 Date

Colorado Smelter
Superfund Site

Early Interim Action Residential Property Cleanups
Operable Unit 1 – Community Properties
Record of Decision
Decision Summary

Colorado Smelter
Superfund Site

Early Interim Action Residential Property Cleanups
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DECISION SUMMARY

Section 1: Site Name, Location, and Description

The Colorado Smelter Superfund Site (Colorado Smelter Site or Site) includes the former ASARCO primary smelter located in the city of Pueblo, Pueblo County, Colorado (Figure 1 in the Appendix). The Site comprises two operable units: OU1, Community Properties, and OU2, the Former Smelter Area. OU1 consists of a preliminary study area based on a one-half mile radius surrounding the former smelter stack location on OU2. Under this Early Interim Action Record of Decision (i-ROD) the EPA is addressing arsenic and lead contamination from smelting waste in residential areas of OU1 at the Site. Contamination in other areas within OU1 will be addressed by a remedy selected under a final Record of Decision for the Site.

There are approximately 1,900 homes and another 400 parcels within the OU1 study area, including vacant properties, commercial businesses, schools, parks and city-owned alleys and rights-of-way. The neighborhoods that are adjacent to the former Colorado Smelter historical footprint and most impacted by Site contaminants are the Bessemer, Eilers, and Grove neighborhoods. OU2 consists of an approximately 700,000 square-foot (16 acres) slag pile and several more acres of active commercial businesses that overlie the former smelter footprint (Figure 2 in the Appendix). This i-ROD addresses residential property cleanups within OU1. EPA will select a final remedy for the residential properties and remaining areas of OU1 (i.e., commercial properties, vacant parcels, parks, and schools), as well as a final remedy for OU2, after additional investigations are concluded at the Site. The EPA Site Identification Number is CON000802700.

Section 2: Site History and Enforcement Activities

2.1 History of Contamination

Pueblo was once home to five ore smelters and one steel mill. The Colorado Smelting Company smelter (also known as Colorado Smelter, Boston Smelter, Boston & Colorado Smelter, and Eilers Smelter) began operating in 1883. It was constructed on a mesa in south Pueblo. Waste slag was deposited in a ravine between Santa Fe Avenue and the Denver & Rio Grande (D&RG) railroad tracks. The owners of the Madonna Mine, located in Monarch, built the Colorado Smelter in order to smelt their extracted silver-lead ore in a cost effective manner. The Colorado Smelter operated eight blast furnaces, two calcining furnaces, one fusing furnace and twenty kilns.

Along with other Pueblo smelters, the Colorado Smelting Company merged with ASARCO in 1899. ASARCO last operated the Colorado Smelter in 1908. After the smelter facility was damaged in the Pueblo Flood of 1921, ASARCO conveyed the property to the Newton Lumber Company. The lumber company operated the Site as a lumber yard into the 1960s. After Newton Lumber Company ownership, the facility property was transferred to a number of individuals and mostly small to medium sized companies.

Some ASARCO facility slag material was used as track ballast for the D&RG track constructed between Florence and Cañon City; and, in 1923, bricks from the blast furnace smoke stack were used to construct St. Mary School.

The historical footprint of the Colorado Smelter is bound by Santa Fe Avenue to the east, Mesa Avenue to the south, Interstate 25 to the west, and the Arkansas River to the north. The Bessemer, Eilers and Grove neighborhoods are adjacent to the former Colorado Smelter facility, which now consists of building remains and an approximately 700,000-square-foot slag pile where access is not completely restricted (Figure 2 in the Appendix).

The potential for contamination at the Colorado Smelter facility was discovered during an earlier inspection of the Santa Fe Bridge Culvert site, which began a series of investigations in the early 1990s and continues today. In 2010, the CDPHE conducted a focused site inspection of properties surrounding the Colorado Smelter. This study determined the presence of elevated lead and arsenic levels that pose a threat to current and future residents.

On May 12, 2014, EPA proposed adding the former Colorado Smelter to the National Priorities List (NPL) of Superfund sites. The prosposal allowed for initiation of the Remedial Investigation/Feasibility Study (RI/FS). Superfund is the federal program that investigates and cleans up the most complex, uncontrolled or abandoned hazardous waste sites to protect public health and the environment. This proposal was published in the Federal Register, initiating a 60-day comment period, which ended on July 11, 2014. EPA received numerous comments regarding the NPL proposal, and published a responsiveness summary to the comments received. On December 11, 2014, EPA listed the Site on the NPL.

The neighborhoods that are adjacent to the former Colorado Smelter facility and most impacted by Site contaminants are the Bessemer, Eilers, and Grove neighborhoods. Bessemer is directly west of I-25 and the Rocky Mountain Steel Mill, formerly Colorado Fuel & Iron (CF&I), and is bound by Northern Avenue to the south and the Arkansas River to the north. The Eilers neighborhood is located directly east of I-25 and bound by Northern Avenue and the Rocky Mountain Steel Mill to the south, the Arkansas River to the north, and School Street to the east. A portion of the Grove neighborhood lies at the northern edge of the study area, just north of the Arkansas River. These neighborhoods have long been shaped by immigrant families moving to Pueblo to work in the smelters, coal mines and the CF&I steel mill.

Eilers, also known as Bojon Town or Eiler Heights, is one of the neighborhoods shaped by the rich history of many immigrant families. Its story is shared in *Potica, Pints, and Prayers in Old Bojon Town* (See: https://www.pueblo.us/DocumentCenter/View/7189). All three neighborhoods are dominated by single-family homes, and land use is not expected to change.

2.2 Remedial Investigation/Feasibility Study (RI/FS)

EPA conducted a Demonstration of Methods Applicability (DMA) in mid-2015, which assessed soils at 12 residential properties and 6 select locations of the former smelter/slag area. Sampling was conducted in accordance with the EPA-approved *Uniform Federal Policy Quality Assurance Project Plan for Demonstration of Methods Applicability at Colorado Smelter, Revision 2* (DMA QAPP), dated May 8, 2015. Data from the DMA were used to optimize sampling strategies, sample preparation, and analytical methods for the larger RI sampling effort for residential properties at the Site.

RI sampling was initiated in December 2015, in accordance with the EPA-approved *Uniform Federal Policy Quality Assurance Project Plan for OU1 Remedial Investigation at Colorado Smelter*, *Revision 0* (RI QAPP), dated November 11, 2015. Soil data from the 12 DMA properties and the first 290 properties, and dust from 102 homes sampled as part of the RI are included in a Focused Feasibility Study (FFS). The FFS summarizes appropriate response action options so that EPA and State decision makers may select an appropriate remedy in accordance with the NCP. These data have also supported the preliminary identification of the contaminants of potential concern (COPCs) presented in the April 2017 *Technical Memorandum Preliminary Identification of Chemicals of Potential Concern* and calculation of Preliminary Remediation Goals for the Site in the May 2017 *Technical Memorandum Preliminary Remediation Goals for Soil*. Ongoing RI sampling is conducted in accordance with Revision 3 of the RI QAPP. Following completion of the FFS, EPA prepared a Proposed Plan, which identified the alternative that, based on the FFS, best met the requirements of 40 CFR § 300.430(f)(1). EPA issued the Proposed Plan for public comment on July 14, 2017, and conducted a public meeting with the community on August 9, 2017. After evaluating comments received on the Proposed Plan during the public comment period and community meeting, EPA prepared this Early Interim Action

Record of Decision (i-ROD), which describes the remedial alternative EPA has selected to address the contamination at the residential areas on the Site.

Figure 1 shows the general location of the Site/Preliminary Study Area, and Figure 2, The Site Base Map, shows the preliminary study areas and identifies the first 302 yards sampled during the DMA and RI (both figures are in the Appendix). Soils and indoor dust were analyzed for the potential presence of arsenic, lead, and other heavy metals related to the historical Colorado Smelter. Data from the 302 properties and 6 smelter/slag areas evaluated during the DMA and subsequent RI sampling effort will help the EPA to determine the nature and extent of smelter related contamination at the Site and will support the EPA in conducting a baseline human health risk assessment (HHRA).

2.3 Removal Action for Residential Properties

The review and analysis of RI data collected between May 2015 and December 2016 resulted in the completion of 27 indoor dust cleanups (located on 26 separate parcels) within the OU1 preliminary study area as part of an emergency removal action. This early action indoor dust removal response was deemed necessary due to the high levels of lead in interior dust and soil and the risk to human health predicted by the Integrated Exposure Uptake Biokinetic (IEUBK) model for lead in children. Additional information on the emergency removal action can be found in Appendix C of the Focused Feasibility Study, *Action Memorandum – Approval and Funding for an Emergency Removal Action Involving the Cleanup of Lead-Contaminated Indoor Dust in Residential Areas of Pueblo, CO., as a result of Smelting Activities at the Colorado Smelter Site*. Additional RI data indicate that early interim action may be necessary to achieve significant risk reduction quickly and to prevent recontamination of indoor living spaces, while a final remedial solution is developed.

2.4 Enforcement Activities

EPA is the lead agency performing the investigations and cleanup at the Site with federal funding. The Colorado Department of Public Health and Environment (CDPHE) is the support agency.

The primary responsible party at the Site is ASARCO. In August 2005 ASARCO filed for bankruptcy in the United States Bankruptcy Court for the Southern District of Texas. On November 13, 2009, ASARCO's liability was discharged when its plan of reorganization was confirmed. EPA received and utilized some funding from an ASARCO environmental trust.

Section 3: Community Participation

Since early 2012, EPA, CDPHE, and the Pueblo City-County Health Department (PCCHD) have been actively engaged with the community. Meetings with the community between 2012 and early 2014 involved EPA, the State and local health departments, and the Agency for Toxic Substances and Disease Registry (ATSDR). During those meetings, EPA described the levels of arsenic and lead contamination identified in the *2011 Site Inspection Analytical Results Report* which qualified the Site for the National Priorities List (NPL). Proposal to the NPL in May 2014 allowed EPA to initiate the RI/FS process and to fund a detailed characterization of the nature and extent of smelter-related contamination. EPA established a local information repository at:

Pueblo City County Library
Rawlings (Main Branch)
100 E. Abriendo Avenue
Pueblo, CO 81004
719-562-5600

Site documents are also available at the Colorado Smelter webpage:

https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0802700 and by appointment, at the EPA Superfund Records Center located at 1595 Wynkoop Street, Denver, CO 80202-1129.

In December 2014, the Site was added to the NPL. The initial Community Involvement Plan (CIP) interviews and documentation were conducted from October 6 – 9, 2014. The interview summaries are included in the CIP, dated April 1, 2015. The CIP supports communication among the community in and around the Site), EPA, the State health department, and local health department, and encourages community involvement in Site activities.

Listing the Site on the NPL also provided support for the community-led development of a Community Advisory Group (CAG), a CAG facilitator, Technical Assistance Support for Communities (TASC) support, and the participation of the Superfund Redevelopment Initiative and federal Partnership for Sustainable Communities in the Colorado Smelter Revitalization Project. Monthly CAG meetings are advertised in the local newspaper and are attended by community members, EPA, State and local health department representatives, city and county representatives, and congressional representatives. Those meetings provide updates on:

- sampling and analysis status,
- cleanup status,
- outreach materials/Fact Sheets,
- health education, outreach, blood lead screenings and in-home lead risk assessments, and
- the Colorado Smelter Revitalization Project.

The CAG is an independent, non-partisan group consisting of a balance of diverse interests affected by and concerned about the Site and the cleanup process. CIP interviewees defined an effective cleanup as:

- Avoiding unacceptable health risk to residents or animals, regardless of their age or desire to play in the parks, garden in their yards, or dig for pirate treasure in the neighborhood;
- Restoring the habitat and preventing future ecological risk;
- Promoting the economic vitality of the neighborhood;
- Preserving historical structures and the integrity of the neighborhood; and
- Limiting personal liability related to the smelter remediation.

The CIP states that the overarching goal of the group is to have an effective cleanup completed by 2019 by:

- Providing input to EPA and other government entities that play a role in the cleanup to improve decision making for all;
- Sharing information, ideas, and concerns; and
- Serving as a conduit to the larger community.

CAG members also provide information and feedback to EPA and State and local health departments as well as provide CAG workgroup updates to the larger CAG.

EPA and the local health department also provide routine updates to city, county and congressional representatives. Updates include charts that summarize the local health department's outreach efforts and blood lead screening summary data for various age groups in the OU1 Study Area.

The *Proposed Plan for Early Interim Action Residential Property Cleanups, OU1 – Community Properties* was issued on July 14, 2017, and a public notice was placed in the Pueblo Chieftain newspaper on July 13, 2017, outlining interim remedial alternatives and announcing the public comment period and a public meeting. The initial 30-day public comment period was open from July 14, 2017 to August 14, 2017. During the public meeting, which was held on August 9, 2017, from 6-9 p.m. at the PCCHD - 101 W. 9th St., Pueblo, Colorado 81003, a Pueblo resident requested that EPA extend the comment period. A 30-day extension was granted and the new comment period was extended to September 15, 2017. At the public meeting, the EPA answered questions about the Site and the remedial alternatives. EPA also discussed that the reasonably anticipated future land use (RAFLU) for OU1 will remain primarily residential. Residents use municipal water supplied by the City of Pueblo, and current RI data do not include any groundwater sampling. Since this i-ROD does not address groundwater, this was not discussed during the public meeting. A transcript of the public meeting is included in the Administrative Record. EPA's responses to comments received during the public comment period are presented in the Responsiveness Summary, Part 3 of this i-ROD.

Section 4: Scope and Role of Operable Unit or Response Action

The Site comprises two operable units: OU1, Community Properties, and OU2, the Former Smelter Area. OU1 consists of a preliminary study area based on a one-half mile radius surrounding the former smelter stack location on OU2.

There are approximately 1,900 homes and another 400 parcels that include vacant properties, commercial businesses, schools, parks and city-owned alleys within the OU1 study area. The neighborhoods that are adjacent to the former Colorado Smelter historical footprint and most impacted by Site contaminants are the Bessemer, Eilers, and Grove neighborhoods. OU2 consists of an approximately 700,000 square-foot (16 acres) slag pile and several more acres of active commercial businesses that overlie the former smelter footprint. (Figure 2 in the Appendix).

This early interim action is necessary because RI data collected from May 2015 through June 2016 show there is an increased risk of exposure to elevated levels of smelter-related lead and arsenic in residential soils and indoor dust at some homes. In response to these risks, EPA completed indoor dust cleanups at 27 homes within the OU1 study area as part of an emergency removal action during 2016 and the first half of 2017. Residential soil cleanups at these locations should occur as soon as possible to minimize recontamination of indoor living spaces from tracked-in outdoor soils. It is also critical that indoor dust and soil cleanups begin as soon as possible at additional properties in the study area, based on RI data that show potentially unacceptable risks to residents due to exposure to lead and arsenic contamination. While not the basis for this EPA action, elevated blood lead levels in some residents, and community interest, also supported this early interim action prior to RI completion.

The remedy selected in this i-ROD is based on RI soil sample data from 302 homes and indoor dust sample data from 102 homes collected from May 2015 through June 2016. The remedy is necessary to protect current and future residents, other users of these properties, and for the long-term protectiveness of the remedy. EPA will select a final remedy for the residential properties and remaining areas of OU1 (i.e., commercial properties, vacant non-residential parcels, parks, and schools), as well as a final remedy for OU2, after additional investigations are concluded at the Site. This OU1 early interim action will be consistent with, and not preclude, implementation of the final remedy selected for the Site.

Solid wastes had (and still have) the potential to impact surface water of the Arkansas River through the mechanisms of surface runoff and erosion, and waste piles of slag also have the potential to impact surface soils through direct contact, as well as the potential to impact subsurface soils and groundwater under the Site. However, surface water and groundwater will be addressed by the OU2 Conceptual Site Model (CSM) and OU2 RI. Particulate solid waste can also become entrained in the air as a result of wind or human activities and will also be addressed as part of OU2 activities.

Section 5: Site Characteristics

This section includes a description of the conceptual site model (CSM) on which the investigations, risk assessment, and response actions are based. A CSM is used to organize and communicate information about site characteristics, potential exposure routes, and reflects the best interpretation of available information about the Site at any point in time. The major characteristics of the Colorado Smelter Site, and the nature and extent of residential property contamination at this stage of the RI, are summarized below. More detailed information is available in the Administrative Record for the Site.

5.1 Site Overview

This interim remedial action focuses on the residential properties within the OU1 study area, which surrounds OU2, the Former Smelter Area. The OU1 preliminary study area is based on an approximate one-half mile radius surrounding location of the former smelter stack on OU2 (Figure 2 in the Appendix). There are approximately 1,900 homes and another 400 parcels that include vacant properties, commercial businesses, schools, parks and city-owned alleys and rights-of-way within the OU1 study area.

OU2 consists of an approximately 700,000 square-foot (16-acres) slag pile and several more acres of active commercial businesses that overlie the former smelter footprint. There is a wetland on OU2, and surface water drains through OU2 via stormwater conveyances through the wetland and into the Arkansas River.

There is an active steel mill (Evraz/Rocky Mountain Steel/Colorado Fuel & Iron (CF&I)) located to the south of the Site preliminary study area. The CDPHE Resource Conservation and Recovery Act (RCRA) program is the lead regulatory agency for that operating facility. EPA anticipates the continued operation of this facility and it is not included in the Colorado Smelter investigation or cleanup area.

5.2 Site Climate and Meteorology

Pueblo, Colorado is located at about 4,700 feet above mean sea level in a high desert region of southern Colorado at the confluence of the Arkansas River and Fountain Creek. Precipitation is generally low, with the winter months receiving very little moisture (NOAA 2014). Winds are variable, although the prevailing winds at the Colorado Smelter during the time of operation were out of the north and northwest as noted on Sanborn Fire Insurance Maps for the years 1883-1904. Wind rose diagrams from a meteorological station located just south of the Colorado Smelter on the Rocky Mountain Steel Mill for the time periods between January 1, 2003 to December 31, 2005 and March 1, 2008 to February 28, 2009 show prevailing winds out of the west-northwest. Wind data retrieved from the Pueblo Memorial Airport, located about six miles east of Pueblo, shows the annual mean wind speed is approximately 4.4 mph (1.97 m/s), predominantly from the west (270 degrees) (August 1, 2017 NOAA data retrieval source:

ftp://ftp.atdd.noaa.gov/pub/GCOS/WMO-Normals/TABLES/REG_IV/US/GROUP3/72464.TXT).

The region is arid and at times windy, making bare soils prone to movement and creating dusty conditions in the study area and throughout Pueblo. These dry conditions increase the mobility of metals-contaminated soils throughout the community. RI sampling was prioritized for the residential areas in OU1 because people generally spend approximately 87% of their time indoors, with approximately 69% of that time inside their own homes. Following 20 emergency indoor removal actions in the summer of 2016, sampling was focused in the primary downwind direction of the study area, which is to the southeast of the former Colorado Smelter, in the Eilers neighborhood. As noted above, most of the properties within the one-half mile radius study area are residential and that residential land use is not expected to change within the reasonably foreseeable future.

The annual mean temperature during the period of record from 1951 to 2017 was 53°F (11.7°C). The annual mean maximum temperature in Pueblo, Colorado was 69.9°F (21.1C) and the annual mean minimum was 36.2°F (2.3°C). The annual average total precipitation received in Pueblo, Colorado from 1954 through 2017 was 11.81 inches (30.00 cm). An annual maximum of 23.09 inches (58.65 cm) of precipitation was recorded in 1957, and an annual minimum of 3.94 inches (10.00 cm) was recorded in 2002 (NOAA Online Weather August 1, 2017 Data Retrieval:

http://w2.weather.gov/climate/xmacis.php?wfo=pub).

Severe weather in the area is usually in the form of intense rainfall or hail, both resulting from thunderstorms. A ten-year storm event for the area is estimated to be 1.59 to 2.48 inches of rainfall within six hours and a 100-year storm would consist of 3.03 to 5.37 inches of rainfall within 24 hours. The thunderstorm season occurs during late spring and summer. Probable maximum precipitation for a local six-hour event is estimated to be approximately 25.5 inches. Strong winds and hailstorms may accompany thunderstorm activity (NOAA Atlas 14-point precipitation frequency estimates - August 2, 2017 Data Retrieval: https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html on 8/2/2017).

5.3 Conceptual Site Model (CSM) and Sources of Contamination

Figure 3 in the Appendix presents a graphical depiction of the CSM for the Site. The CSM identifies the primary sources of contamination and how residents may be exposed to this contamination.

5.3.1 Sources of Contamination

The primary sources of contamination at the Site that EPA identified in the risk evaluation for this early interim action include:

- Fugitive dust and particulate air emissions from the historic smelter stack.
- Solid wastes such as slag and slag-impacted soils.
- Liquid wastes such as process solutions, acids, and rinsates from historic facility operations.

Findings from RI sampling indicate high levels of lead and arsenic in some OU1 residential soil and indoor dust samples and in the remaining slag areas in OU2.

5.3.2 Other Sources of Lead and Arsenic

In addition, EPA included other sources of lead and arsenic that may contribute to the overall risk for residents at the Site in their overall risk evaluation. Although EPA considered the effects of these other sources of lead and arsenic in the risk evaluation, the Superfund cleanup authority is only able to address those sources of contamination that result from historic smelter operations. These other non-smelter, that is, secondary sources of lead and arsenic in the community may include:

- The historic use of leaded gasoline;
- Household paint made before 1978; and
- The potential historic use of arsenical pesticides and herbicides.

The Pueblo City-County Health Department has conducted healthy home screenings in OU1 that indicate the presence of lead-based paint in exterior and interior paint in pre-1978 home stock (95% of the homes located within OU1 are pre-1978), as well as other sources, such as consumer products, glazes on pottery, sinks and tubs and possible aged plumbing.

A Site-specific background study will be conducted, because multiple other sources of metals are present in the environment both naturally and as a result of human activities. The background study results will be used to support the HHRA for the OU1 RI and for the Site at large. The background study results also will be used as part of the final COPC determination. For this action, regional naturally occurring (geogenic) background concentrations were used as a comparison to Site data and in the development of soil and dust cleanup levels.

5.3.3 Site Release Mechanisms

Through the mechanisms of air dispersion and deposition, air emissions from the former smoke stacks, slag piles, and historic use of unleaded gas had the potential to impact surface soils and surface water, potentially contaminating these media. Historic air emissions from the smelter stacks are not a current source of contamination to the air in the preliminary study area; however, fugitive dust emissions caused by wind or human activity may still occur. The half-mile initial study area surrounding the main stack of the Colorado Smelter was established based on other non-Site studies which indicated that "Major smelter deposits exist primarily within a 0.5 km radius of the stack, although some studies have found elevated soil-Pb [lead] concentrations as far away as 30 km and drop to 200 mg/kg and below by distances of approximately 3-5 km" as well as the local topography and land use. Soil lead concentrations typically decrease dramatically with distance from the source, and depend greatly on wind speed and wind direction.

Solid wastes had (and still have) the potential to impact surface water of the Arkansas River through surface runoff and erosion. Waste piles of slag have the potential to impact surface soils through direct contact, and the potential to impact subsurface soils and groundwater under the Site by infiltration of rain or snowmelt that leaches metals contamination out of the slag, transporting this contamination down the soil column. Surface water and groundwater will be addressed by the OU2 CSM and OU2 RI. Particulate solid waste can also become entrained in the air as a result of wind or human activities.

5.3.4 Potential Receptors and Exposure Pathways

After Site-related contamination migrated from the smelter stacks and other smelter sources to the surface soil and subsurface soil being evaluated for this RI), interactions between the soils have provided ongoing pathways for contaminant transport, including transport into homes. This has contributed to elevated concentrations of arsenic or lead in indoor dust. Findings from previous screening investigations and early RI sampling indicate elevated concentrations of arsenic and lead in multiple residential soil and indoor dust samples.

Assuming that the current sample population is generally representative of the study area as a whole, approximately 43% of the 1,900 properties in the study area are likely to have concentrations of arsenic or lead in soil exceeding chronic cleanup levels of 61 ppm and 350 ppm in soil, respectively. The calculations used to derive the Site-specific cleanup levels are described further in Section 7.2 and are summarized in Section 8.2. The majority of residential soil samples evaluated for this early interim action show that contaminants were detected at concentrations exceeding Site-specific cleanup levels from the surface to 12 inches below ground surface. Under the selected remedy (see Section 12), an estimated 817 properties may require cleanup to 12 inches and 195 of those properties may require cleanup to 18 inches. For dust cleanups approximately 578 homes, that is, about 30% of 1,900 homes in the study area, may need an indoor dust cleanup due to having lead or arsenic above the chronic indoor dust cleanup levels of 275 ppm or 61 ppm, respectively. Figures 7-9 in the Appendix depict the number of homes where contamination in soils and indoor dust exceed cleanup levels based on soil data from samples taken from the 302 properties and dust data from the 102 properties included in the FFS.

Assuming there are about 2.4 persons per household and 1,900 homes within the preliminary study area, there may be about 4,560 people living within one-half mile of the former smelter stack. If 817 properties require soil cleanup, then up to 1,961 residents currently may be exposed to soil contamination. In addition, if 578 homes require indoor dust cleanup, then up to 1,387 residents currently may be exposed to indoor dust contamination.

The potential exposure routes by which potential human receptors may come in contact with the contaminants include inhalation of the air-entrained particles/dust; ingestion (eating or drinking); and dermal contact (or direct physical contact). A baseline human health risk assessment (HHRA) will be performed at a later date and will include all available RI sampling results, as well as a complete exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. The HHRA will also quantify the risks for each complete source-pathway-receptor as appropriate. An ecological risk assessment will be performed as part of the OU2 RI; which EPA anticipates commencing in late 2017 or early 2018.

5.4 OU1 Remedial Investigation Sampling Strategy

EPA Region 8 used an incremental composite sampling strategy that was developed using a systematic planning approach in cooperation with EPA's Office of Superfund Remediation & Technology Innovation and EPA's Remedial Action Contractor. The strategy, which uses X-Ray Fluorescence spectrophotometry (XRF) with collaborative EPA Contract Laboratory Program (CLP) Inductively Coupled Plasma Mass Spectrometry (ICP/MS) laboratory analysis, was tested and refined in the field during the May 2015 DMA. The strategy has been implemented by Pacific Western Technologies (PWT), EPA's Remedial Action Contractor (RAC), in coordination with Region 8 to address Site-specific conditions and issues and ensure adequate data support for long-term decision making at the Site.

The sampling strategy includes assessing metals in residential soils and indoor dust for lead and arsenic via a Pueblo-based XRF laboratory. The more conventional, offsite laboratory approach, using CLP analysis, includes the following Target Analyte List (TAL) metals: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc. Nutrient metals, aluminum, calcium, iron, magnesium, potassium, sodium are excluded. Bioavailability and geospeciation analyses for lead and arsenic in Site-specific matrices were completed using special analytical services at the University of Colorado and EPA's standard operating procedures for in vitro bioaccessibility for lead and arsenic.

Exposure scenarios that were evaluated included: residential, recreational, and other specific scenarios (e.g., construction and utility worker exposure). Evaluations were completed for exposure via direct contact with surficial soil (within the 0–1.5 feet below ground surface (bgs) interval) and indoor dust (e.g., ingestion, inhalation, dermal contact). In addition, the historical use of leaded gasoline along the I-25 traffic corridor and other main traffic routes in and adjacent to the OU1 preliminary study area, arsenical pesticides, and lead-based paint are considered in the evaluations.

Decision Units (DUs) are delineated to be consistent with property type and exposure scenario. A typical residential property is comprised of 5 DUs – one for each side yard, one for each of the front and backyards, and one for the drip zone around the house. For this action, the complete yard is considered to be the exposure unit (EU) for each property, since residents may be exposed to Site contaminants throughout the yard. The majority of residential DUs are characterized using four individual 5-point composite samples from a systematic random sampling grid with one composite sample collected from each of four horizons (0-1″, 1-6″, 6-12″, and 12″-18″) where properties are less than 5,000 square feet. A subset of residential DUs including those units with the largest areas (greater than 5,000 square feet), are sampled via incremental composite sampling (ICS). For each DU sampled by ICS, 30 specific sample aliquot points within the DU will be determined via random start systematic grid method with one sample taken from each of four horizons (0-1″, 1-6″, 6-12″, and 12″-18″).

QA/QC samples including field replicate samples are collected in triplicate (two replicate samples collected along with one associated investigative sample) from selected DUs at a frequency of 5% (one triplicate set per 20 investigative samples). Triplicate samples will typically be collected from all four depths at a given DU. The current strategy of selecting one DU for a field-replicate sample set per 20 DUs has ensured that triplicates are available for a range of distances and directions from the smelter, a wide range of concentrations, and a variety of DU types. A small number of replicate samples (approximately 5% of samples) were collected for mercury analysis during the first year of the RI. These samples were collected as discrete samples that were not processed for XRF analysis to prevent volatilization of mercury. Mercury sampling was terminated based on a data evaluation that found detectable mercury to be statistically insignificant, therefore, mercury was not retained as a COPC. After the first 100 properties were sampled, differences between measured concentrations within triplicate sample sets were evaluated to identify sources of variability; possible soil heterogeneity, matrix interference effects, sampling errors, or laboratory errors or other sources of error. Results of this evaluation indicated that variability was insignificant, therefore, corrective actions related to sampling and analysis were not needed. A decision error evaluation was conducted of 1,710 triplicate sample results collected through March 2017. This evaluation found that false negative rates were below the goal of 5% for arsenic (1.8%) and lead (2.8%) and false positives were below the goal of 20% for arsenic (4.1%) and lead (9.0%) using the preliminary decision limits of 30 ppm for arsenic and 400 ppm for lead. Therefore, no corrective actions related to the statistics applied to the data were warranted.

5.5 OU1 Contamination Types and Affected Media

Early interim action to address elevated levels of arsenic and lead contamination in soil and dust in advance of the completion of RI sampling is necessary to quickly achieve significant risk reduction and to prevent further environmental degradation, while a final remedial solution is developed. With this goal in mind, indoor dust cleanups were completed during 2016 and 2017 at 27 homes (located on 26 separate parcels) within the OU1 preliminary study area as part of an emergency removal action. This early interim action indoor dust removal response effort was deemed necessary due to the high levels of lead in interior dust and soil and the risk to human health predicted by the IEUBK model. Additional information on the emergency removal action can be found in the July 15, 2016, EPA Action Memorandum, *Approval and Funding for an Emergency Removal Action Involving the Cleanup of Lead-Contaminated Indoor Dust in Residential Areas of Pueblo, CO., as a Result of Historic Smelting Activities at the Colorado Smelter Site*, residential yard soil cleanups at these locations should occur as soon as possible to prevent recontamination. Figure 6 in the Appendix identifies the locations of homes where indoor dust has already been remediated. Based on RI data, it is critical that additional dust and soil cleanups begin as soon as possible at additional properties in the study area.

5.5.1 Contaminants of Potential Concern (COPCs)

TAL metals that are assessed in soil and dust samples for the residential properties include: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc. The analyses exclude the following nutrient metals: aluminum, calcium, iron, magnesium, potassium, sodium.

Throughout the initial data evaluation for this early interim action, which follows the OU1 Uniform Federal Policy Quality Assurance Project Plan (UFP QAPP), several metals were not retained as COPCs since they were not detected in concentrations greater than their respective risk-based screening levels (RBSLs), or as in the case of mercury, was not detected at high frequencies and is not a suspected Site contaminant. Therefore, the 11 metals retained as Site COPCs include: antimony, arsenic, cadmium, cobalt, copper, lead, manganese, nickel, thallium, vanadium, and zinc. The *Colorado Smelter Technical Memorandum: Preliminary Identification of Contaminants of Potential Concern* provides more details regarding COPC and COC selection.

For this early interim action, lead and arsenic are COCs, based on Site-specific risk calculations for a residential exposure scenario. Based on the results of the residential soil and indoor dust sampling, EPA has determined that elevated concentrations of arsenic and lead in indoor dust are related to the elevated concentrations of arsenic and lead measured in exterior soil.

Section 7.5 provides additional detail regarding the typical Superfund COPC/COC selection process, which was used for this early interim action and will be used again with the full RI dataset. EPA anticipates that Site COCs for the final Record of Decision (ROD) will most likely be lead and arsenic. A preliminary examination of the other 9 metals being screened as COPCs indicates that several of the COPCs are unlikely to contribute to unacceptable Site risk based on a comparison of the upper 95% confidence limit (95UCL) to their respective RBSLs. However, the 95UCLs for arsenic and lead exceed both their respective RBSLs and their natural (geogenic) background threshold values (BTVs). These 9 other metals will be carried through the RI and examined in the final human health risk assessment. The risk-based concentrations for these metals have been developed and no homes sampled so far have had any levels of these 9 metals closely approaching these identified levels. For this early interim action, analytical results from the 12 DMA properties and the first 290 RI properties were evaluated and presented in the FFS and supporting documentation. COPC determination was made using the data from 1,361 decision units (DUs) at 290 residential properties. This set of properties was selected for preliminary identification of COPCs because metals contamination, chiefly arsenic and lead, was observed in some samples at levels warranting an emergency removal action. Each DU included samples for up to four depth ranges: 0 to 1 inch below ground surface (bgs), 1 to 6 inches bgs, 6 to 12 inches bgs, and 12 to 18 inches bgs. The 1,361 DUs and the associated depth ranges resulted in 5,828 total samples from the 290 properties.

5.5.2 Characteristics of COPCs

Individuals may be exposed to Site contaminants through inhalation of particles of dust in the air; ingestion (eating or drinking); and dermal contact (direct physical contact). Long-lasting (chronic) exposure to lead, even at low levels, may cause subtle but harmful impacts to the central nervous system, which can affect learning and behavior. Lead is not considered a carcinogen; however, over time, lead may cause more severe nervous system damage, anemia, kidney damage, brain damage, or at extremely high levels, seizures and even death. Children below 7 years of age, unborn children and pregnant women are especially susceptible to the toxic effects of lead; however long-term exposure in adults may contribute to high blood pressure, kidney problems, and cognitive dysfunction.

Exposure to arsenic through inhalation of particles of dust in the air, and ingestion of, and dermal contact with soils, can cause a variety of health problems. Health effects linked with exposure to elevated levels of arsenic over long periods are an increased risk for some types of cancer such as skin, lung, bladder, kidney, and liver cancers.

Maximum concentrations of lead found by media

Soil: 3,910 parts per million (ppm)
Dust: 2,060 ppm (unfinished attics excluded)

Table 1: Statistical Summary of Soil Lead Data
(based on Technical Review Workgroup for Lead support document)

Group	Samples	Decision Units	Properties	Lead Concentration (ppm)		
				Min	Max	Mean
0-1" bgs, DU averages, XRF	1,555	1,384	302	7.27	1,470	302
1-6" bgs, DU averages, XRF	1,514	1,353	302	19.4	3,910	322
6-12" bgs, DU averages, XRF	1,565	1,364	302	19.3	2,790	242
12-18" bgs, DU averages, XRF	1,549	1,348	302	14.7	2,430	155
All depths, DU averages, XRF	6,374	5,449	302	7.27	3,910	255
0-1" bgs, DU averages, ICP/MS	174	173	173	6.7	1,560	316
1-6" bgs, DU averages, ICP/MS	179	175	175	26.7	3,910	382
6-12" bgs, DU averages, ICP/MS	135	131	131	10.3	1,790	251
12-18" bgs, DU averages, ICP/MS	123	121	121	12.6	2,460	181
All depths, DU averages, ICP/MS	611	600	302	6.7	3,910	294
0-1" bgs, property averages, XRF	1,555	1,384	302	47	907	310
1-6" bgs, property averages, XRF	1,514	1,353	302	60.3	2,210	338
6-12" bgs, property averages, XRF	1,565	1,364	302	46	1,100	261
12-18" bgs, property averages, XRF	1,549	1,348	302	26	967	168

Notes: DU = Decision Units (described in sampling method Section 5.4)
Property averages are the average of the area-averaged concentration for each property.
Mean values for the ICP/MS samples are generally higher than those for XRF because a disproportionate number of confirmation samples were collected from higher concentration DUs early in the project.
XRF = X-Ray Fluorescence spectrophotometry

Maximum concentrations of arsenic found by media

Soil: >200 parts per million (ppm)
Dust: 47 ppm (unfinished attics excluded)

Table 2: Statistical Summary of Dust Lead Data
(from the Technical Review Workgroup for Lead support document)

Group	Samples or Properties	Lead Concentration (ppm)		
		Min	Max	Mean
All data	263 samples	8.2	2,130	209
Unfinished attics excluded*	254 samples	8.2	2,060	184
Property Averages	102 properties	10	1,514	187

*Note that one finished attic was included in this group because it was used as living space.

5.6 Geospeciation

Geospeciation and mineralogy of dust and soil samples were conducted during the RI in order for EPA to accurately determine whether some portion of the arsenic and lead contamination at OU1 came from smelter-related activities. These data supported development of the CSM and will also support the HHRA. Based on dust and soil sample results from the DMA and the ongoing OU1 RI, PWT selected 15 dust samples, three waste pile samples, and 32 soil samples for geospeciation testing. Examination of the mineral forms of arsenic and lead in the samples was performed by Dr. John Drexler at the Laboratory for Environmental and Geological Studies (LEGS), University of Colorado at Boulder. Dust and soil samples were selected to represent the range of arsenic and lead concentrations to provide a spatially representative group of samples for the OU1 residential community as shown in Figure 2 in the Appendix.

Dr. Drexler reported that each set of soil and dust samples studied since 2015 showed small differences in both arsenic and lead speciation, but that they were all dominated by pyrometallurgical and mining/milling related metal species. Metal forms that are common to these processes include the following oxides and metal oxides: Slag, PbAsO, CaAsO, PbMO, Galena, Arsenopyrite, AsMO, SnMO, CuMO, SnMO, As2O3, and ZnMO. Although cerussite and anglesite commonly found in these samples can also be related to lead-bearing paint, many of the particles are either too large to be paint pigments or are directly associated with other phases (slag, galena, pyrite, etc.) that have no relation to lead paint. Results indicate that soils contain a significantly smaller relative mass presence of leaded paint than dust samples. One potential cause of this observation is the fact that soil samples were sieved to <250 microns, unlike the dust samples. Since such a large proportion of the lead and arsenic are found in pyrometallurgical and mining/milling related phases, it is most likely that lead and arsenic found in iron oxyhydroxide (FeOOH) and Phosphates in both soil and dust samples as well as in the waste pile samples are related to alteration of the smelter-related forms listed above. In other words, based on this study, EPA believes most of the lead and arsenic contamination in soils, slag, and dust within OU1 came from operations at the historic Colorado Smelter.

5.7 Bioavailability

Bioavailability is the degree and rate at which a substance (such as arsenic or lead) is absorbed into a living system, and which therefore may be available for a physiological effect. EPA tested the bioavailability characteristics of arsenic and lead in soils to determine how likely it was that an individual who ingested Site-specific arsenic and lead contaminants might be negatively affected. Soil testing to estimate the Site-specific relative oral bioavailability of arsenic and lead was another data need identified to support development of the CSM and for the OU1 RI HHRA. Based on soil sample results from the DMA and the initial 290 homes from the RI, a total of 53 residential soil samples were selected for bioaccessibility testing and estimation of relative oral bioavailability (12 samples from the DMA, and an additional 41 samples from the RI). Samples were selected to represent the range of arsenic and lead concentrations and to provide a spatially representative group of samples for the OU1 residential community. Soil samples from different depth intervals were included, even though residents are most likely to come into contact with surface soil. Soil samples were selected to represent a range of different locations relative to potential Colorado Smelter sources. Soil samples were collected in accordance with the DMA QAPP and OU1 QAPP. Dust samples were not included in this analysis. The results of this testing indicated that relative oral bioavailability for lead was 63% and for arsenic was 48%. The default bioavailability for both lead and arsenic is 60%.

5.8 Site-specific Background Study

A Site-specific background study will be conducted, because multiple other sources of metals are present in the environment both naturally and as a result of human activities. The background study results will be used to support the Baseline HHRA for the OU1 RI and for the Site at large. The background study results will also be used as part of the COPC determination for the final ROD.

Section 6: Current and Potential Future Land and Resource Uses

Most of the property within OU1 is currently in residential use. The neighborhoods that are adjacent to the former Colorado Smelter and which are most likely to be impacted by Site contaminants are the Bessemer, Eilers, and Grove neighborhoods. The character of these neighborhoods has long been shaped by immigrant families moving to Pueblo to work in the smelters, coal mines and CF&I steel mill. Eilers, also known as Bojon Town or Eiler Heights, is one of the neighborhoods shaped by the rich history of many immigrant families. Its story is shared in *Potica, Pints, and Prayers in Old Bojon Town* (See: https://www.pueblo.us/DocumentCenter/View/7189).

All three neighborhoods are dominated by single-family homes, and based on current zoning of the Site, the reasonably anticipated future uses at most properties is residential. Therefore, EPA has determined that residentially zoned property within OU1 should be remediated to residential use cleanup levels and meet residential land use criteria.

The definition of the preliminary study area, and hence the evaluation of reasonably anticipated future land uses, also considered the distance between the former Colorado Smelter main stack and the edges of the neighborhoods to the north, west, south, and east. The preliminary study area boundary and the number of residences investigated may be increased or decreased as data provide more information about the area affected by the Colorado Smelter.

In addition to residential properties, five parks, one school and numerous vacant lots, commercial properties, alleys and city rights-of-way will be sampled as part of the RI. If sampling results for these properties indicate high levels of arsenic and lead, early interim action may be needed at those locations as well, and these actions will be addressed through revisions to this i-ROD, as warranted by Site conditions. Changes in land use for the non-residential parcels in OU1 and OU2 may be considered as part of future actions.

There is an active steel mill (Evraz/Rocky Mountain Steel/Colorado Fuel & Iron (CF&I)) located to the south of the Site preliminary study area. The CDPHE Resource Conservation and Recovery Act (RCRA) program is the lead regulatory agency for that operating facility. EPA anticipates the continued operation of this facility and it is not included in the Colorado Smelter investigation or cleanup area.

In March 2014, the Colorado Department of Transportation (CDOT) and the Federal Highway Administration issued a Record of Decision pursuant to the National Environmental Policy Act for Interstate 25 (I-25) Improvements through Pueblo. CDOT's ROD was focused on Phase 1 of the preferred alternative identified in the environmental impact statement for the project, which is predominantly located north of the Site preliminary study area. Phase 2 of CDOT's project, which has not been funded, or been the subject of a ROD, would impact a portion of EPA's OU1 and OU2. CDOT's planned I-25 realignment would go over the Former Smelter Area slag piles and some residential properties located south of Benedict Park. To date, CDOT has completed two bridge improvement projects within the EPA's Site preliminary study area at Mesa Avenue and Northern Avenue.

St. Mary's Help of Christians Church has been an important center for the community, in the last century and now. The church is located in the southern portion of OU2. It had previously been located to the north in the Grove neighborhood, but following the Pueblo Flood of 1921, it was moved to higher ground at its present location. Prior to the land becoming church property, it was part of the Colorado Smelter. In 1923, bricks from the smelter stack were used to build the St. Mary's School, presently known as the St. Mary's Gornick Slovenian Library, Museum, and Genealogy Center (See: https://www.pueblo.us/DocumentCenter/View/7189). The church property is mostly hardscaped. Where soils are available to be sampled, they will be characterized as part of the ongoing RI for OU2. A determination of reasonably anticipated uses for this property will be made in the OU2 final RI and/or a final Site ROD.

Although smelter sources of contamination are uncontained with regard to the groundwater pathway, the drinking water in the preliminary study area is provided by municipal water sources that are not impacted by lead or arsenic. A seep observed on the slagheap during Site visits may indicate a hydraulic connection between groundwater and surface water. Both the seep and the Santa Fe Avenue Bridge Culvert may serve as conveyances of shallow groundwater to the surface water of the Arkansas River. Groundwater and surface water will be characterized as part of the OU2 RI.

Section 7: Summary of Site Risks

The scope of the RI data collection to date has focused on residential areas. Because elevated levels of smelter-related arsenic and lead were detected in residential soils and indoor dust at levels above regional or national health-based screening levels, EPA evaluated residential exposure scenarios for the development of the Site-specific Preliminary Remediation Goals (PRGs). The PRGs formed the basis for the cleanup levels included in this i-ROD. Concentrations of arsenic and lead above PRGs indicate the need for further action. As a result of elevated indoor dust lead levels, emergency indoor dust cleanups have been completed at 27 homes based on lead levels in homes that are associated with elevated lead in outdoor soils. Since the RI sampling is not yet finished, EPA does not yet have a comprehensive Site data set available for completion of the baseline human health risk assessment (HHRA).

Because risks associated with exposure to lead are of concern at this Site, EPA Region 8 completed two required consultations with EPA's Office of Superfund Remediation and Technology Innovation prior to finalizing Site-specific cleanup levels and cleanup decision documents. EPA Region 8 consulted with the EPA headquarters' Technical Review Workgroup Lead Committee and then with the Remedy Decisions Branch of the Office of Superfund Remediation and Technology Innovation. Both groups reviewed and approved EPA Region 8's use of Site-specific and updated default input parameters in the IEUBK model to derive the Site-specific PRGs for lead in soil and dust. The December 2016 Office of Land and Emergency Management (OLEM) Directive (#9200.2-167), also known as EPA's *Updated Scientific Considerations for Lead in Soil Cleanups*, requires that specific consultations occur for sites where lead is a principal contaminant of concern. The OLEM Directive #9200.2-167 suggests that a target blood lead level of 2-8 µg/dL may be more appropriate and considered in some cases. For example, the *2013 Integrated Science Assessment for Lead* found that several studies have observed "clear evidence of cognitive function decrements in young children with blood lead levels between 2-8 µg/dL". Because of this, the OLEM Directive recommends consideration of existing lead policy as well as:

- Current scientific evidence of adverse health effects associated with blood lead levels below 10 µg/dL,
- Site-specific bioavailability of lead-containing source materials,
- The use of additional Site-specific IEUBK model input parameters to derive screening levels,
- Continued use of Superfund removal authorities to address imminent risks,
- The role of natural and human-influenced background levels,
- A multi-pathway approach working across programs and including collaboration with federal, state and local partner agencies, and
- Prioritization of resources for investigation and assessment of lead sites.

The EPA Region 8 is using the above considerations as part of the approach to address risks at the Site.

7.1 Identification of Chemicals of Concern

EPA considered 17 metals as preliminary COPCs for the OU1 interim risk assessment and documented this consideration in the *Colorado Smelter Technical Memorandum: Preliminary Identification of Contaminants of Potential Concern*. Those included antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc.

Five of the 17 metals listed above, including barium, beryllium, chromium, selenium, and silver were not retained as preliminary COPCs for OU1, because the maximum concentrations for these metals in the CLP data set did not exceed their respective RBSLs. In the case of mercury, it is not a suspected contaminant from the Colorado Smelter, and only four of 228 total sample results for this metal exceeded the RBSL (less than 2%). Based on the low frequency of mercury exceedance and the small magnitude of the exceedances, mercury was not retained as a preliminary COPC.

Therefore, the 11 metals retained as COPCs include: antimony, arsenic, cadmium, cobalt, copper, lead, manganese, nickel, thallium, vanadium, and zinc. These are considered preliminary COPCs for OU1, because the maximum concentrations for soil samples exceeded the RBSL for one or more depth ranges. Although there are 11 preliminary COPCs based on this analysis, (including arsenic, lead, and the nine others), the uncertainty analysis in Section 5 of the COPC technical memorandum indicates that nine of the COPCs are unlikely to contribute to unacceptable Site risk based on a comparison of the 95UCL to RBSLs. Lead and arsenic were retained as COCs, based on Site-specific risk calculations for a residential exposure scenario.

In addition to the soil samples from 302 yards, dust samples were collected and analyzed for 102 properties. Since a percentage of soils will be tracked into homes from outdoors, a Site-specific mass fraction of soil in dust (MSD) value was developed for lead from this subset of OU1 indoor dust data collected and analyzed for metals. The MSD value represents an estimate of the fraction of lead in indoor dust that is attributable to lead in soil at an OU1 residence. This Site-specific MSD value, which was 0.36, was used for all COPCs. In addition, modifications to the risk-based concentration (RBC) calculations were made to allow for both dust and soil ingestion to be considered. RBCs are calculated chemical-specific concentrations corresponding to a target risk level, usually a cancer risk level of 10-6 for carcinogens and a hazard index of 1.0 for noncarcinogenic effects. RBCs are based on a specific set of exposure scenarios and pathways. The Site-specific MSD value was used in those calculations to estimate the dust concentration relative to the soil concentration. Based on the results of this residential soil and indoor dust analysis, EPA determined that elevated concentrations of arsenic and lead in exterior soil are related to the elevated concentrations of arsenic and lead measured in indoor dust.

7.2 Exposure and Toxicity Assessment

Site-specific PRGs, which are based on Site data, Site-specific exposure scenarios, and COPC toxicity, formed the basis for Site-specific cleanup levels. Concentrations of arsenic and lead above PRGs indicate the need for further action. The chronic PRGs calculated by EPA are intended for comparison to area-weighted average concentrations for residential properties within OU1. Acute PRGs were also calculated and are intended for use as not-to exceed values for any decision unit (DU) and depth at a residential property within OU1.

In order to calculate PRGs, the following general process was followed, although the method varied slightly depending on the COPC (specifically between lead and other COPCs):

1) First, RBCs were calculated for both cancer and non-cancer risks using COPC-specific toxicity values and exposure parameters for a residential receptor.
2) Second, the RBC was compared to a BTV. The BTVs were developed using a geogenic background data set from a subset of 20 U.S. Geological Survey (USGS) samples from Pueblo County and bordering counties. This USGS background study, *Geochemical and Mineral Data for Soils of the Conterminous United States* is representative of geogenic (naturally occurring) background levels of metals and does not include those in the urban background, which will be evaluated in a separate Site-specific background study to be conducted as part of the RI.
3) Third, the higher of the RBC and the BTV was selected as the PRG. For those COPCs that present both cancer and non-cancer risks, the lower of the RBC values for cancer and non-cancer effects was selected as the RBC and used for comparison to the BTV.

Two sets of PRGs were calculated. The first PRG is to be applied to each property as a not-to-exceed value for the area-weighted average lead concentration in order to prevent exposure that could result in chronic toxicity health effects (Chronic Exposure PRG). In the chronic exposure scenario, the complete yard is considered to be the exposure unit (EU) for each property. The second PRG is to be applied to each decision unit (DU) and depth as a not-to-exceed value in order to prevent exposure that could result in acute toxicity effects (Acute Exposure PRG).

7.2.1 Site-Specific Exposure Parameters

Several exposure parameters, or data variables, are used in the IEUBK model. Site-specific values were developed for two of the exposure parameters used in the calculation of PRGs. These are the relative oral bioavailability (RBA) values for metals, as reported in the bioavailability technical memorandum, and the mass fraction of soil in dust, as reported in the EPA technical memorandum *Site-Specific Soil-To-Dust Mass Transfer Ratio (M_{SD}) Calculation.*

Relative Oral Bioavailability

Relative oral bioavailability was studied for arsenic and lead using a subset of soil samples collected from OU1. For conservativeness, EPA default RBA values for all COPCs are 1, with the exception of arsenic and lead, which have default EPA RBAs of 0.60. A RBA of 1 assumes that *all the material is available for uptake in the body*. The Site-specific RBA value for lead was 0.63, and the Site-specific RBA value for arsenic was 0.48. The Site-specific RBA for arsenic is lower than the default RBA for arsenic, while the Site-specific RBA for lead is slightly higher than the default RBA for lead. All other COPCs are assumed to have the standard default RBA value of 1.

Mass Fraction of Soil in Dust

The mass fraction of soil in dust (M_{SD}) value represents the mass fraction of house dust that is derived from outdoor soil. A Site-specific M_{SD} value was developed for lead from a subset of data for 102 homes from OU1 with dust samples collected and analyzed for metals. The M_{SD} value represents an estimate of the fraction of lead in dust that is attributable to lead in soil at a residence within OU1.The M_{SD} value was developed using statistical regression of average dust concentrations against area-weighted averaged surface soil concentrations for lead following the methodology of Brattin and Griffin, 2011.

This Site-specific M_{SD} value, which was 0.36, was used for all COPCs. The default M_{SD} value in the IEUBK model for lead in children is 0.7. RBC values for lead were calculated using both the default and the Site-specific M_{SD} values for comparison. Numerous studies at other sites in EPA Region 8 have identified values for the M_{SD} much lower than the default value, which further supports the reasonableness of the calculated Site-specific value.

7.2.2 Calculation of Preliminary Remediation Goals for Lead in Soil

Two lead PRGs were developed to assist in informing risk-management decisions. The methodology for lead is similar to the methodology used later for other COPCs, and is described in more detail here.

Concentrations of lead above the lead PRGs indicate the need for further action. The first PRG is a PRG to be applied to each property as a not-to-exceed value for the area-weighted average lead concentration in order to prevent exposure that could result in chronic toxicity effects (Chronic Exposure PRG). This PRG was developed using the IEUBK Model for Lead in Children, version 1.1, build 11. Chronic toxicity values were used to develop this PRG. This PRG is appropriate for comparison with the property-specific area-weighted averages for entire properties because long-term exposure is expected to occur over all parts of the property, not for specific DUs and depths. In the chronic exposure scenario, the complete yard is considered to be the exposure unit (EU) for each property.

The second PRG for lead is to be applied to each DU and depth as a not-to-exceed value. This PRG was also developed using the IEUBK model. Acute toxicity values for lead were used to develop this Acute Exposure PRG. This PRG is appropriate for specific DUs and depths because short-term exposure could occur in specific areas of the yard. In the acute exposure scenario, each specific DU is considered to be the EU.

Chronic Exposure RBC for Lead

Chronic Exposure RBCs, the calculated chemical-specific concentration corresponding to a target risk level, and used to develop Chronic Exposure PRGs were determined using the IEUBK model. The PRG is developed from RBCs calculated to ensure no greater than a 5% chance of exceeding a blood lead level of 10 µg/dL. For comparison, RBCs were also calculated for a blood lead level of 5 µg/dL (Table 3).

Chronic Exposure RBCs for lead were developed using Site-specific values for the M_{SD} and RBA parameters, literature review intake rates proposed for future use in the IEUBK model, and default IEUBK values for all other IEUBK parameters.

Table 3: Chronic Lead Soil RBCs Based on 5 and 10 µg/dL Blood Lead Targets

M_{SD} and RBA Values	M_{SD}	RBA	Ingestion Rates	Chronic RBC (mg/kg or ppm)	
				Blood Lead Target = 5 µg/dL	Blood Lead Target = 10 µg/dL
Site-Specific	0.36	0.63	Von Lindern (EHP)	240	740

Notes:
EHP Environmental Health Perspectives, September 2016, Volume 124, Issue 9
IEUBK Integrated Exposure Uptake Biokinetic
µg/dL micrograms per deciliter
mg/kg milligrams per kilogram or parts per million (ppm)
M_{SD} Mass fraction of soil in dust
NA Not applicable
RBA Relative bioavailability
RBC Risk-based concentration

Chronic Exposure PRG for Lead

Because both of the Chronic RBCs calculated for lead exceed the BTV of 49.8 mg/kg or parts per million (ppm)[1], the BTV will not be selected as the Site-specific Chronic PRG for soil. Based on a target blood lead level of 10 µg/dL, literature review values for intakes being proposed for future use in the IEUBK model, Site-specific values for M_{SD} and RBA, and current IEUBK model default values for all other parameters, the calculated Chronic RBC for lead is 740 ppm.

The December 2016 Office of Land and Emergency Management (OLEM) Directive (#9200.2-167) suggests that a target blood lead level of 2-8 µg/dL may be more appropriate and considered in some cases. Current scientific literature on lead toxicology and epidemiology provides evidence that adverse health effects are associated with blood lead levels less than 10 µg/dL. For example, the *2013 Integrated Science Assessment for Lead* found that several studies have observed "clear evidence of cognitive function decrements in young children with blood lead levels between 2-8 µg/dL." In light of these scientific findings regarding adverse effect levels for lead and the range of community-specific risk factors present at the Colorado Smelter Site, EPA selected a soil lead cleanup level of 350 ppm. Using the IEUBK model and the Site-specific values for the parameters described above, the blood lead level predicted to result from a cleanup level of 350 mg/kg is 6.24 µg/dL, which is well within the range recommended by OLEM. The soil lead cleanup level of 350 ppm is intended for comparison to area-weighted average results for each property and comports with guidance in the EPA *Superfund Lead-Contaminated Residential Sites Handbook*.

[1] EPA technical supporting documents show lead and arsenic in milligrams per kilogram (mg/kg); however, parts per million (ppm) has been more commonly used in public meetings and presentations and was used for the proposed plan and i-ROD. Both mg/kg and ppm are the same ratios and can be used inter-changeably. For example, if you had 20 ppm, it would be like having 20 white marbles and 999,980 black marbles out of 1,000,000 total marbles.

Acute Exposure RBC for Lead

The Agency for Toxic Substances and Disease Registry (ATSDR) recommends that "medical evaluation and environmental investigation and remediation should be done for all children with blood lead levels equal to or greater than 20 µg/dL." In addition, EPA recommends that acute exposure be characterized relative to a range of blood lead levels up to 20 µg/dL. Therefore, the IEUBK model was run with a target blood lead level of 20 µg/dL to calculate the acute exposure RBCs (Table 4).

Table 4: Acute Lead Soil RBCs based on 20 µg/dL Blood Lead Target

M_{SD} and RBA Values	Blood Lead Target (µg/dL)	M_{SD}	RBA	Ingestion Rates	Acute RBC (mg/kg or ppm)
Site-Specific	20	0.36	0.63	Von Lindern (EHP)	1,918

Notes:
EHP Environmental Health Perspectives, September 2016, Volume 124, Issue 9
IEUBK Integrated Exposure Uptake Biokinetic
µg/dL micrograms per deciliter
mg/kg milligrams per kilogram or parts per million (ppm)
M_{SD} Mass fraction of soil in dust
NA Not applicable
RBA Relative bioavailability
RBC Risk-based concentration

Acute Exposure PRG for Lead

Because the Acute RBCs calculated for lead exceed the background threshold value (BTV) of 49.8 ppm, the BTV will not be selected as the Site-specific Chronic PRG for soil. Based on literature review values for intakes being proposed for future use in the IEUBK model, Site-specific values for M_{SD} and RBA, and current IEUBK model default values for all other parameters, the calculated Acute PRG for lead in residential yard soil is 1,918 ppm. This Acute PRG is intended for comparison to specific DU and depth results and would be applied as a not-to-exceed value to protect against acute exposure effects.

7.2.3 Calculation of PRGs for COPCs other than Lead in Soil

Concentrations of arsenic or other COPCs above PRGs indicate the need for further action. As described in the preceding section for lead, two PRGs were developed for each COPC. The first is a PRG to be applied to each property (EU) as a not-to-exceed value for the area-weighted average COPC concentration. The second PRG is to be applied to each DU and depth as a not-to-exceed value for that DU and depth.

Chronic Exposure PRGs for COPCs other than Lead

Methodology, as outlined in the *EPA Regional Screening Level (RSL) Users Guide*, was followed for the development of the RBCs and PRGs for COPCs other than lead. However, in addition to exposure to soil, exposure to indoor dust was assumed for the ingestion pathway, resulting in modifications to the standard equations for the ingestion pathway.

RBCs were developed for target risk levels of 1E-06, 1E-05, and 1E-04 to cover the EPA's acceptable risk management range, as discussed in the *RSL User's Guide* and the NCP, 40 CFR 300.430. PRGs were calculated for a target risk level of 1 E-5. The contaminant-specific toxicity values and exposure parameters are shown below in Tables 5 and 6.

Table 5: Contaminant-Specific Toxicity Values and Exposure Parameters for COPCs other than Lead

COPC	Chronic RfD_o (mg/kg-day)	Chronic RfC_i (mg/m^3)	SFO $(mg/kg\text{-}day)^{-1}$	IUR $(\mu g\text{-}m^3)^{-1}$	RBA	GIABS	ABS_d
Antimony	4.0E-04	NA	NA	NA	1	0.015	NA
Arsenic	3.0E-04	1.5E-05	1.5E+00	4.3E-03	0.48[a]	1	0.03
Cadmium	1.0E-03	1.0E-05	NA	1.8E-03	1	0.025	0.001
Cobalt	3.0E-04	6.0E-06	NA	9.0E-03	1	1	NA
Copper	4.0E-02	NA	NA	NA	1	1	NA
Manganese	2.4E-02	5.0E-05	NA	NA	1	0.04	NA
Nickel	2.0E-02	9.0E-05	NA	2.6E-04	1	0.04	NA
Thallium	1.0E-05	NA	NA	NA	1	1	NA
Vanadium	5.0E-03	1.0E-04	NA	NA	1	0.026	NA
Zinc	3.0E-01	NA	NA	NA	1	1	NA

Notes: [a]The RBA value for arsenic is a Site-specific value.

ABS_d Fraction of contaminant absorbed dermally from soil
COPC Contaminant of potential concern
GIABS Fraction of contaminant absorbed in gastrointestinal tract
IUR Inhalation unit risk
$\mu g/m^3$ micrograms per cubic meter
mg/kg milligrams per kilogram
mg/m^3 milligrams per cubic meter
NA Not applicable
RBA Relative bioavailability
RBC Risk-based concentration
RfC_i Reference concentration (inhalation)
RfD_o Reference dose (oral)
SFO Oral slope factor

Table 6: Receptor-Specific Exposure Parameters

Exposure Parameter	Variable Name	Child	Adult	Units
Averaging Time (Noncancer)	AT_{nc}	2,190	Not used	days
Averaging Time (Cancer)	AT_{ca}	NA	25,550	days
Exposure Duration	ED	6	20[a]	years
Exposure Frequency	EF	350	350	days/year
Exposure Time	ET	24	24	hours/day
Body Weight	BW	15	80	kilograms
Ingestion rate (soil + dust)	IRS + IRD	200	100	mg/day
Fraction of ingestion as soil	Not used	0.45	0.45	unitless
Ingestion rate (soil)	IRS	90	45	mg/day
Ingestion rate (dust)	IRD	110	55	mg/day
Surface area	SA	2,373	6,032	cm^2
Adherence factor	AF	0.2	0.07	mg/cm^2
Mass fraction of soil in dust	M_{SD}	0.36	0.36	unitless
Particulate emission factor	PEF	1.36E+09	1.36E+09	m^3/kg
Target risk	TR	1E-06 to 1E-04	1E-06 to 1E-04	unitless
Target hazard quotient	THQ	1	1	unitless

Notes: [a]The exposure duration of 26 years total was used for all RBC calculations. However, for brevity in the equations, the equations shown were presented in a slightly modified form to use an ED for the adult resident of 20 years, rather than subtracting an ED of 6 years for the child from the calculated 26 years for the adult. The calculations are equivalent to those shown in the RSL Users Guide.

cm^2 Square centimeters
mg/day milligrams per day
mg/cm^2 milligrams per square centimeter
m^3/kg cubic meters per kilogram

The calculated chronic exposure RBCs for COPCs other than lead are listed below in Table 7. The lower of the cancer and non-cancer RBC is selected as the overall chronic exposure RBC.

Table 7: Chronic Exposure RBCs for COPCs other than Lead

COPC	Chronic Exposure Carcinogenic RBC (mg/kg or ppm)			Chronic Exposure Noncarcinogenic RBC (mg/kg or ppm)	Overall Chronic Exposure RBC (mg/kg or ppm)[a]
	TR = 1E-06	TR = 1E-05	TR = 1E-04		
Antimony	NA	NA	NA	48	48
Arsenic	1.2	12	120	61	12
Cadmium	2,100	21,000	210,000	100	100
Cobalt	420	4,200	42,000	36	36
Copper	NA	NA	NA	4,800	4,800
Manganese	NA	NA	NA	2,800	2,800
Nickel	15,000	150,000	1,500,000	2,400	2,400
Thallium	NA	NA	NA	1.2	1.2
Vanadium	NA	NA	NA	600	600
Zinc	NA	NA	NA	36,000	36,000

Notes: [a]The overall chronic exposure RBC is the lower of the chronic exposure RBCs for carcinogenic and noncarcinogenic exposure, and assumes a target risk of 1E-05 and a target hazard quotient of 1.

COPC Contaminant of potential concern
mg/kg milligrams per kilogram or parts per million (ppm)
NA Not applicable
RBC Risk-based concentration
TR Target risk

Chronic Exposure PRG for COPCs other than Lead

The next step in the process of determining the Chronic exposure PRG is to compare the Chronic RBC to the BTV calculated in the COPC technical memorandum. If the BTV is higher than the RBC, the BTV is selected as the Chronic PRG. Otherwise, the RBC is used as the PRG. Chronic RBCs, BTVs, and Chronic PRGs for each COPC other than lead are listed in Table 8.

Table 8: Chronic Exposure PRGs for COPCs other than Lead

COPC	BTV (mg/kg or ppm)	RSL (mg/kg or ppm)	Chronic Exposure Carcinogenic RBC (mg/kg or ppm)[a]	Chronic Exposure Noncarcinogenic RBC (mg/kg or ppm) [a]	Chronic Exposure PRG (mg/kg or ppm)[b]	Source of Selected PRG
Antimony	1.99	39	NA	48	48	NC PRG
Arsenic	12.7	0.68	12	61	61	NC PRG
Cadmium	2.23	160	21,000	100	100	NC PRG
Cobalt	16.0	23	4,200	36	36	NC PRG
Copper	33.3	3,100	NA	4,800	4,800	NC PRG
Manganese	2,650	1,800	NA	2,800	2,800	NC PRG
Nickel	30.8	1,500	150,000	2,400	2,400	NC PRG
Thallium	0.900	0.78	NA	1.2	1.2	NC PRG
Vanadium	135	390	NA	600	600	NC PRG
Zinc	143	23,000	NA	36,000	36,000	NC PRG

Notes: [a]The chronic carcinogenic RBC is calculated at a risk of 1E-05.

[b]The chronic exposure PRG for each target risk level is generally the larger of the BTV or the chronic exposure RBC for that risk level. For arsenic, the noncarcinogenic RBC was selected as the PRG because the carcinogenic RBC is below the BTV and is anticipated to be below the Site-specific urban background.

BTV Background threshold value
CA Carcinogenic
COPC Contaminant of potential concern
mg/kg milligrams per kilogram or parts per million (ppm)
NA Not applicable
NC Noncarcinogenic
PRG Preliminary remediation goal
RBC Risk-based concentration in soil
RSL Regional Screening Level

Acute Exposure RBCs for COPCs other than Lead

Calculation of Acute exposure RBCs followed the same methodology used for Acute exposure PRGs. However, only noncancer exposure was included, and instead of chronic toxicity values, acute toxicity values were identified and used.

Acute RfDo and RfCi values were compiled from the Risk Assessment Information System (RAIS) online and are listed in Table 9. The same exposure parameters were used for the calculation of Acute exposure RBCs as were used for chronic exposure RBCs.

Table 9: Acute Exposure RBC/PRGs for COPCs other than Lead

COPC	Acute RfD_o (mg/kg-day)	Acute RfC_i (mg/m^3)	Acute Exposure RBC/PRG (mg/kg or ppm)
Antimony	NA	NA	NA
Arsenic	5.0E-03	2.0E-04	1,000
Cadmium	NA	3.0E-05	43,000
Cobalt	NA	NA	NA
Copper	1.0E-02	1.0E-01	1,200
Manganese	NA	NA	NA
Nickel	NA	2.0E-04	280,000
Thallium	NA	NA	NA
Vanadium	NA	NA	NA
Zinc	NA	NA	NA

Notes:
COPC Contaminant of potential concern
mg/kg milligrams per kilogram or parts per million (ppm)
mg/kg-day milligrams per kilogram body weight per day
mg/m^3 milligrams per cubic meter
NA Not applicable
PRG Preliminary Remediation Goal
RBC Risk-based concentration
RfCi Reference concentration
RfDo Reference dose

<u>Acute Exposure PRGs for COPCs other than Lead</u>

The next step in the process is to compare the RBC to the BTV calculated in the COPC memorandum. In all cases, the Acute exposure RBCs were higher than the BTV; therefore, the Acute PRG is equivalent to the RBC listed above.

These PRGs are preliminary, and if needed, may be updated/changed based on additional data collected during the RI. This includes, but is not limited to, the results of a Site-specific background study that is anticipated to be completed, any additional relative bioavailability data collected, and changes to the IEUBK, default assumptions, or changes to the actual model itself, if they occur during the RI process.

<u>Chronic PRGS for Lead and Arsenic in Indoor Dust</u>

The PRG of 275 ppm for lead in indoor dust was calculated directly from the IEUBK model and corresponds to the maximum indoor dust concentration that would be allowable when the soil concentration is at 350 ppm. Since there is not a model available to estimate the maximal indoor concentration allowable for arsenic, the arsenic indoor dust PRG was set at 61 ppm, which corresponds to the lower of the chronic exposure RBCs for carcinogenic and noncarcinogenic exposure, and assumes a target risk of 1E-05 and a target hazard quotient of 1. It is important to note that the arsenic levels in living area samples evaluated for the i-ROD have been below 47 ppm.

7.3 Lead contamination and effects

Sampling results from EPA's investigation of residential soils and indoor dust show elevated levels of lead. The Pueblo field laboratory analyzed soil samples using an XRF. The Decision Unit (DU) average concentrations of lead in all depths of soils collected from each of the first 302 homes sampled ranged from 7.27 to 3,910 ppm (Table 1). Dust samples from 102 homes were sent to an offsite laboratory and the lead concentrations in indoor dust from living areas have ranged from 8.2 to 2,060 ppm (Table 2).

Individuals may be exposed to Site contaminants through inhalation of particles of dust in the air; ingestion (eating or drinking); and dermal contact (direct physical contact). Long-lasting (chronic) exposure to lead, even at low levels, may cause subtle but harmful effects to the central nervous system, which can affect learning and behavior. Lead is not considered a carcinogen; however, over time, lead may cause more severe nervous system damage, anemia, kidney damage, brain damage, or at extremely high levels, seizures and even death. Children below 7 years of age, unborn children and pregnant women are especially susceptible to the toxic effects of lead; however, long-term exposure in adults may contribute to high blood pressure, kidney problems, and cognitive dysfunction.

EPA uses the IEUBK model and other Site-specific information to predict the levels of lead contamination in children's blood. At the Site, the levels of lead in the soils and indoor dust may cause levels of lead in the blood that EPA has determined are unacceptable. EPA measures the amount of lead in blood as the predicted Blood Lead Level (BLL). With the current levels of contamination, children in the Colorado Smelter study area may develop a BLL above 20 micrograms per deciliter (µg/dL) due to exposure to lead in soils and indoor dust. As noted above, there is evidence of cognitive function decrements in young children with blood lead levels between 2-8 µg/dL.

7.4 Arsenic contamination & effects

Exposure to arsenic through inhalation of particles of dust in the air, and ingestion of, and dermal contact with soils, can cause a variety of health problems. Health effects linked with being around elevated levels of arsenic over long periods are an increased risk for some types of cancer such as skin, lung, bladder, kidney, and liver cancers.

EPA's investigations also found elevated levels of arsenic contamination in residential soils and indoor dust in homes above the State of Colorado average background level of 11 ppm. Arsenic concentrations ranged from very low levels (4.3 ppm) to over 323 ppm in residential soil samples and from 1 to 47 ppm in indoor dust samples.

EPA's soil cleanup level for arsenic at OU1 is 61 ppm, which is the non-carcinogenic RBC, selected because the carcinogenic RBC of 12 ppm is below the calculated natural background threshold value (BTV) of 12.7 ppm. EPA also anticipates it will be below the Site-specific urban background. Urban background arsenic concentrations will be determined specifically for this Site. Typical urban background arsenic concentrations that are seen in the geographic region typically range from 14 to 20 ppm. This 61 ppm level is protective and conservative when compared to 120 ppm (see Table 10 below), which is the level at which a risk of approximately one additional instance of cancer in 10,000 people (10-4) may occur. This level is also consistent with EPA NCP regulation that establishes a range of acceptable risk as 10-4 to 10-6, or a range of one excess cancer in 10,000 cases to one excess cancer in 1,000,000 cases.

For indoor dust, the non-carcinogenic RBC of 61 ppm was selected as the arsenic cleanup level. This level of 61 ppm was selected because the cancer risk RBC of 12 ppm is lower than the natural BTV of 12.7 ppm. It is also expected to be below the Site-specific urban background. This 61 ppm level is protective and conservative when compared to 120 ppm, which is the cancer risk of approximately one additional instance of cancer in 10,000 people (10-4). This level is also consistent with EPA regulation in the NCP that establishes a range of acceptable risk as 10-4 to 10-6, or a range of one excess cancer in 10,000 cases to one excess cancer in 1,000,000 cases.

Table 10: Chronic Exposure RBCs for Arsenic

COPC	Chronic Exposure Carcinogenic RBC (mg/kg or ppm)			Chronic Exposure Noncarcinogenic RBC (mg/kg or ppm) [a]	Overall Chronic Exposure Carcinogenic RBC (mg/kg or ppm) [a]
	TR = 1E-06	TR = 1E-05	TR = 1E-04		
Arsenic	1.2	12	120	61	12

Notes: [a]The overall chronic exposure RBC is the lower of the chronic exposure RBCs for carcinogenic and noncarcinogenic exposure, and assumes a target risk of 1E-05 (carcinogenic) and the target hazard quotient of 1 (noncarcinogenic); however, 12 ppm is lower than natural background, therefore 61 ppm was selected.

COPC Contaminant of potential concern
mg/kg milligrams per kilogram or parts per million (ppm)
RBC Risk-based concentration
TR Target risk

7.5 Other Contaminants of Potential Concern

At this time, arsenic and lead appear to be the principal COCs for the residential properties portion of OU1 at the Site; however, the initial RI dataset identified 17 metals that were considered to be of potential concern at the Site. After additional analysis, EPA determined that nine COPCs apply to OU1 because they exceeded the risk-based concentrations and background for one or more depth ranges in the soil. These include: antimony, cadmium, cobalt, copper, manganese, nickel, thallium, vanadium, and zinc.

Although there are 11 preliminary COPCs based on this analysis, (including arsenic, lead, and the nine others), the uncertainty analysis in Section 5 of the EPA's COPC technical memorandum indicates that several of the COPCs are unlikely to contribute to unacceptable Site risk based on a comparison of the 95UCL to RBSLs.

COPC selection is traditionally done at the end of the sample collection process, with the complete RI dataset. However, due to possible ongoing exposure at the Site, EPA determined it was appropriate to take an early interim action at the residential properties portion of OU1. At the conclusion of the RI data collection process, COPC selection will again be undertaken on the full dataset to better characterize the COPCs associated with the Site.

7.6 Uncertainties Assessment

This section provides a preliminary discussion of the types of uncertainties associated with EPA's approach to this preliminary risk assessment. The discussion focuses on issues likely to cause the greatest effects on the results of the risk analyses. The HHRA will provide a more detailed discussion of uncertainties.

7.6.1 Data Uncertainties

Sources of uncertainty in the data and Site characterization include:

- Selection of locations and depths of samples for analysis
- Spatial coverage of the Site
- The heterogeneity (i.e., diversity) of chemical concentrations in the Site soil.

It is not possible to completely characterize all affected media. Estimates of concentrations in affected media must be based on a limited number of samples, literature values, interpolation, or extrapolation. The possibility exists that the sampling results do not completely and thoroughly characterize the contaminants in soil and dust and will be an uncertainty in the HHRA.

7.6.2 Exposure Assumptions Uncertainties

Exposure assumptions generally involve much uncertainty. For example, EPA cannot know exactly how much time every resident living within the Site actually spends inside or outside their home, or even in the City of Pueblo. Exposure parameters are selected using a combination of available guidance values and professional judgment, both of which include considerable uncertainty. The exposure assumptions EPA used to select this remedial action are generally conservative, in order to be more protective. The uncertainty associated with exposure scenarios is also considered small because the data quality used to derive these exposure parameters and conditions are adequate.

7.6.3 Toxicity Assumptions Uncertainties

Several aspects of the toxicological data employed in calculating the Site-specific cleanup levels contain a high degree of uncertainty that may result in an overestimate of potential risk posed by existing contamination at the Site. The toxicity factors used in this assessment, which are established by state and federal policy, are deliberate overestimates of the potential dose-response. This means that actual risks are unlikely to be higher than the potential risk estimates calculated in this assessment and are likely to be lower.

7.6.4 Uncertainties in Risk Characterization

The HHRA will present a more complete discussion of the cumulative effect of the uncertainties in the assumptions and methodology on the risk estimates.

Site risk uncertainties include unknown contaminant concentration ranges over the course of RI data collection and the use of regional natural background metals levels for the early interim action rather than Site-specific background levels, which help account for human-made influences in metals concentrations throughout Pueblo.

Since EPA collected samples within the one-half mile OU1 preliminary study area that were adjacent to, farther away, and in all directions from the Former Smelter Area (OU2) smoke stack, EPA is confident that the arsenic, lead, and other COPC concentration ranges observed thus far in the RI are representative of minimum and maximum levels of contamination likely to be present throughout OU1. The use of regional background values is an acceptable method for calculating PRGs/cleanup levels and the EPA Region 8 Superfund program has significant experience with determining appropriately conservative and protective cleanup levels for residential areas that have been impacted by historic smelters.

The cleanup levels presented in this i-ROD are preliminary, and if needed, may be updated/changed based on additional data collected during the RI. These additional data may include, but are not limited to, the results of a Site-specific background study, any additional relative bioavailability data collected, changes to the IEUBK default assumptions, or changes to the actual model itself, if they are made during the RI process. Final soil and dust cleanup levels are not anticipated to change but will be selected as part of the final OU1 ROD. The more specific findings of the HHRA, and the OU1 clean-up objectives will be included in the subsequent final action ROD for the operable unit.

The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

7.7 Ecological Risk

The evaluation of ecological risk will be undertaken as part of a comprehensive evaluation under the OU2 investigation. A determination of risk and any cleanup related to ecological receptors will be made in the OU2 Record of Decision.

Section 8: Remedial Action Objectives

Remedial action objectives (RAOs) are medium-specific or location-specific goals for protecting human health and the environment. This section presents the RAOs EPA selected to protect human health from Site-related contaminants for this OU1 early interim action.

8.1 Need for Remedial Action

Based on the investigations at the Site and the risk evaluation, EPA has determined that the risks related to lead and arsenic contamination from the historic smelter are unacceptable and action is warranted under Superfund. Quantitative support for this action is detailed in Section 7. Section 7.2 describes the process used to develop Site PRGs for lead and arsenic in soils and dust. The PRGs are also the Site cleanup levels. For soil, the cleanup levels are 61 ppm for arsenic and 350 ppm for lead. The soil Hotspot or Not-to-Exceed (NTE) cleanup level for arsenic is 1,000 ppm and for lead is 1,918 ppm. For indoor dust, the arsenic cleanup level is 61 ppm and the indoor dust lead cleanup level is 275 ppm.

Sections 7.3 and 7.4 describe lead and arsenic contamination levels observed at the Site for the data set used in this i-ROD. The DU average concentrations of lead in all depths of soils collected from the first 302 homes sampled ranged from 7.27 to 3,910 ppm. Dust samples from 102 homes were sent to an offsite laboratory and the lead concentrations in indoor dust from living areas have ranged from 8.2 to 2,060 ppm. Arsenic concentrations ranged from very low levels (4.3 ppm) to over 323 ppm in residential soil samples and from 1 to 47 ppm in indoor dust samples.

8.2 Remedial Action Objectives

EPA developed the following OU1-specific Remedial Action Objectives (RAOs) for arsenic and lead in residential soil and indoor dust in order to protect human health from lead and arsenic at the Site and to describe what the cleanup will accomplish. The principle RAO for the Colorado Smelter Site is to protect human health from Site-related contaminants, namely lead and arsenic. EPA considers current and reasonably anticipated future use of the site when determining RAOs. Based on current zoning of the Site, the reasonably anticipated future uses at most properties include residential use. Therefore, EPA has determined that residentially zoned property within OU1 should be remediated to meet residential land use criteria. Non-residential properties will be evaluated as part of future actions.

The RAOs outlined below will reduce exposure to elevated levels of arsenic and lead in soils and dust, thus reducing the potential for health impacts associated with elevated arsenic and lead.

8.2.1 RAOs for Arsenic and Lead in Soil

The RAOs for arsenic and lead in soil are intended to reduce human exposure to soils with contamination exceeding health based cleanup levels. The arsenic cleanup level is 61 milligrams per kilogram (ppm) and the lead cleanup level is 350 ppm. The Hotspot or NTE cleanup level for arsenic is 1,000 ppm and for lead is 1,918 ppm.

8.2.2 RAOs for Arsenic and Lead in Indoor Dust

Similarly, the RAOs for arsenic and lead in dust are intended to reduce human exposure to indoor dust exceeding the health based cleanup levels for arsenic and lead in indoor dust. The indoor dust arsenic cleanup level is 61 ppm and the indoor dust lead cleanup level is 275 ppm.

RAOs have not been developed for animals, plants and other such ecological receptors at the Site at this time. They will be developed as part of the Operable Unit 2 (OU2 – Former Smelter Area) RI and documented in a future OU-specific ROD.

Although not part of the RAOs above, the RI includes a grant to the Pueblo City-County Health Department (PCCHD) lead program for on-going lead screening, health education and outreach.

Institutional controls will be needed for properties where contaminated soil is left in place above levels safe for unlimited use and unrestricted exposure. Although the need for ICs at specific properties and what kind of ICs may be needed will be evaluated, the public will have an opportunity to review and comment on that portion of the remedy as part of the final ROD for OU1. Institutional controls developed for OU1 will comply with the Colorado Environmental Covenant Statute, C.R.S. §§ 25-15-317 et seq.

Section 9: Description of Alternatives

This section describes remedy components, also described in the Focused Feasibility Study (FFS) as General Response Actions (GRAs) which may be implementable as part of the remedial alternatives for this early interim action. For completeness and since they may be implemented as part of the final Site remedy, potential GRAs that were screened but not retained as remedy components are also summarized below.

Remedy components or GRAs, which were identified and screened, included containment controls, migration controls, removal, and chemical and physical treatment. They were also screened for effectiveness, implementability, and cost in accordance with EPA guidance. The screening of technology types and process options is detailed in the following narrative and summarized for soil in Table 11 and for indoor dust in Table 12, both in the Appendix.

- Effectiveness: The effectiveness evaluation focuses on the potential effectiveness of the process options in handling the estimated volume of soils or areas of concern and meeting the RAOs, the potential risk to human health and the environment during implementation, and how proven or reliable the technology and process is for handling the contaminants and conditions at the Site.
- Implementability: The implementability evaluation examines the technical and administrative feasibility of implementing a technology and process option.
- Cost: The cost evaluation looks at relative capital costs rather than detailed estimates. Engineering judgment is used to determine whether the costs associated with each process option are high, medium, or low relative to other process options under that technology type.

9.1 Remedy Components Screened and Retained

Engineering controls such as containment, migration controls and removal of contaminated soils and containment and/or removal of contaminated indoor dust may be combined with appropriate treatment technologies, health education and institutional controls to form the basis of a range of protective remedial alternatives for the Site.

9.1.1 Soil

Migration controls reduce the movement of contamination from source areas into the surrounding soils. Surface controls were the only migration control technology considered for the OU1 early interim action remedy. Process options for surface controls include grading, revegetation, and erosion protection. These options are generally employed in concert at larger sites, to reduce the amount of precipitation coming in contact with contaminated soils or wastes. Grading, erosion control and revegetation can be effective in reducing the migration of contaminants away from source areas, however, without adequate controls, such as wetting down soils to minimize airborne particles, the soil disturbance associated with grading could expose workers or neighbors to airborne particles.

Stormwater flow must be considered when grading is employed both to protect the replaced soil from erosion and to ensure there are not negative impacts to neighboring properties. Stormwater drainage controls may be required as part of this response action. Surface controls require ongoing maintenance in order to remain effective in the long term. These considerations make the effectiveness of surface controls low as a stand-alone option. Therefore, grading, revegetation and erosion control will be used in conjunction with soil removal and replacement options for residential areas.

Soil removal and replacement is a three-stage process involving excavation of contaminated soils, disposal of excavated materials, and replacement with clean soils. In some cases, where contamination is left in place below the depth of the excavation, a visible barrier material will be placed, such as snow fence or geotextile.

Conventional earth moving refers to the variety of excavation techniques which may be employed for moving soil utilizing hand tools and/or heavy equipment as space allows. Removal and replacement of soils is a highly effective means of preventing or reducing long term exposures to soils containing unacceptable levels of lead and/or arsenic, even though excavation activities may result in short term impacts such as dust generation and disturbance of vegetation.

If all smelter-related soil contamination exceeding soil cleanup levels is removed, there should not be any need for ongoing operation or maintenance (O&M) except for maintenance of for vegetative cover. However, if sampling data indicate that some contamination is left in place at depths greater than the prescribed excavation depth, O&M requirements and ICs (i.e. placement of snow fence or geotextile barrier) may be required. Please note that ICs will be considered, as necessary, for OU1 properties when a final Site-wide record of decision is issued. Soil removal by excavation is readily implementable and will be used in the interim action.

Offsite disposal at a landfill is a protective option for disposing of contaminated materials that pose an unacceptable risk to human health or the environment. Landfills may be RCRA facilities or sanitary landfills, depending on the nature of the materials to be disposed. Hazardous materials taken offsite will be managed in accordance with all applicable federal and state requirements. Offsite disposal is an effective, proven, and reliable option for reducing human contact with soils containing unsafe levels of arsenic and/or lead. Offsite disposal is readily implementable and will be used in the interim action.

9.1.2 Dust

Reducing direct human contact with arsenic and/or lead contamination in indoor dust presents a unique challenge in that conditions vary greatly from one home to the next. Technology types and process options that would be unworkable to implement at one home might be the only reasonable alternative at another. Similarly, process options that might be unnecessary at one home may form a key component of achieving a protective remedy at another. In all cases, indoor dust cleanups can only be moderately effective at reducing exposures in the long-term unless the potential for recontamination is addressed (i.e. through yard soil cleanups). Containment controls and removal are the two GRAs considered for indoor dust.

Applying plastic sheeting to create a barrier between exposed soil and living areas (for example, in a semi-finished, inhabited basement or dirt crawlspace) is an effective short term option to reduce direct human contact with contamination inside the home. Long term effectiveness of the option will depend on the specifics of the house in which this method is utilized and how much day to day wear and disturbance the plastic sheeting must withstand. This process option may involve increased contact with exposed soil and increased dust generation during implementation, and so it is rated as moderately effective overall. This option is readily implementable and relatively low cost. Therefore, application of plastic sheeting will be used as a component of the indoor dust remedy.

Removal is another engineering control considered for indoor dust. Removal of contamination from indoor surfaces may be accomplished by cleaning contaminated surfaces or by removing and replacing contaminated surfaces. Cleaning interior surfaces is accomplished by a variety of conventional wet cleaning techniques, including wet mopping floors, washing walls, wiping down or washing counters and furniture, shampooing carpets, etc. and HEPA vacuuming. Cleaning interior surfaces is highly effective in the short term, but ineffective in the long term unless measures are taken to prevent recontamination (i.e. yard soil cleanup). Cleaning interior surfaces is readily implementable from both a technical and an administrative standpoint. Cleaning interior surfaces is relatively low cost when compared to other technologies and process options for removing contamination from homes. Cleaning interior surfaces will be used as part of the indoor dust remedy.

Removing and replacing interior surfaces is another process option for removal of contamination from inside homes. This process option includes removing and replacing contaminated carpets that cannot otherwise be cleaned/remediated effectively. This option is highly effective in the short term, even though it can increase worker contact with contamination due to dust generation during implementation. In the long term, this option can be highly effective if the potential for recontamination is appropriately addressed through yard cleanups or other means. Replacing carpet requires coordination for disposal of contaminated materials, selection of appropriate replacement flooring, and agreement with the residents or property owners on the replacement flooring selected. The effectiveness of this option can be increased by replacing carpet with hard surfaces such as vinyl. A separate contractor may be required for installation of replacement flooring. For these reasons, the implementability of this option is moderate. The cost of removing and replacing contaminated interior surfaces is moderate. Removing and replacing carpet will be used as a component of the indoor dust remedy, where needed.

9.2 Remedy Components Screened and Not Retained

9.2.1 Soil

Containment controls are engineered barriers which limit exposure to and the potential mobility of soil or waste. Typical process options for containment include engineered soil cover, soil-clay cover, asphalt cover, concrete cover, and synthetic membrane cover. Soil and soil-clay covers are somewhat effective provided they are appropriately maintained. Asphalt, concrete and synthetic membrane covers may be highly effective when long term maintenance is applied. Covers are difficult to install and maintain over small, non-contiguous areas such as residential yards or portions of yards, making the implementability of these options low for this Site. Cost to construct and maintain soil covers is relatively low, costs for soil-clay covers are medium, and costs to install and maintain asphalt, concrete or synthetic covers are relatively high. Although there are advantages and disadvantages to each of these containment process options, all require significant long-term maintenance to be effective. Because of this, covers were not retained for further consideration.

Process options for disposal of contaminated soils or wastes are onsite disposal and offsite disposal. Onsite disposal would require building a waste repository near the location of original waste generation and moving contaminated soils to that repository. Designing and building a waste repository can be a long process, which lowers the short term effectiveness of this option. When construction of an onsite repository is a viable option, it can be highly effective at reducing exposures to waste in the long term and can be less costly than offsite disposal. Whether onsite disposal is a viable option depends on current site ownership, land use, topography, the volume of waste to be disposed of and the available area(s) onsite appropriate for a waste repository. The former facility property, (OU2), which is considered the source area for the Site is currently owned by several parties. Multiple commercial operations are located on the flat and accessible portions of the former facility property. Remedial investigation of OU2 has not yet begun, and the final fate of the waste located there is not currently known. Significant time and effort would be required to identify an area suitable for a waste repository, and to negotiate with landowners for consent for EPA to design and build a repository at a given location. These factors would likely prevent onsite disposal from being implemented in a timely manner. For these reasons, onsite disposal of waste is not implementable from a technical or administrative standpoint and was not retained for further consideration.

Two primary treatment technologies were evaluated for potential use at the Site, including chemical treatment (soil amendment) and physical treatment (soil tilling). The process option considered for chemical treatment is the application of phosphate soil amendments. Phosphate stabilization is a procedure in which phosphate salts or acids are physically mixed into soil. This chemical additive can reduce the bioavailability of lead in soil below levels that are unsafe for human exposure. However, phosphate would not impact the bioavailability of arsenic or other metals in soil. Phosphate addition has the potential to increase the solubility of some metals, most notably arsenic, as discussed in the EPA's June 2015 *Phosphate Amendment Fact Sheet*. Phosphate stabilization is moderately effective and moderately implementable; however, because of the tendency to mobilize arsenic, it was not retained for further consideration.

The process option evaluated for physical treatment is soil tilling. Soil tilling involves the physical turning over and mixing of the soil column. Tilling the surficial 12 inches of the soil column may reduce surface concentrations of arsenic and lead below risk based clean-up levels. Soil tilling with revegetation is a viable stand-alone alternative when surficial soil concentrations are close to cleanup levels and concentrations of contaminants are much less deep in the soil column. However, soil tilling is not an option when contaminant concentrations are similar throughout the soil column, or when very high concentrations exist within the depth interval to be tilled. Soil tilling is typically used in large areas such as agricultural fields where heavy equipment can maneuver easily. For small areas such as the residential yards in OU1 of the Site, soil tilling may be impractical to implement. Soil tilling overall is considered to be a moderately effective process option because it can be highly effective in certain cases, but ineffective in others. Due to the small size of the majority of properties within the study area, it was not retained for use in conjunction with other approaches.

ICs are non-engineering mechanisms which may be employed to reduce human exposure to media of concern. ICs are not typically implemented as a stand-alone action, but are generally utilized together with engineering controls to form a protective remedy. The three types of ICs considered are governmental controls, proprietary controls, and information devices.

- Governmental controls include zoning regulations, local ordinances, building permits or other provisions imposed by the state or local government to restrict land or resource use and ensure that a remedy is protective. Governmental controls are somewhat effective in reducing exposure to contamination, but they can be difficult and costly to implement over the long term. Governmental controls are generally considered appropriate as a component of the final remedy at a site. Governmental controls were not retained for inclusion in the remedial alternatives for this early interim action at the Site, but may be considered for OU1 properties when a final Site-wide record of decision is issued.
- Proprietary controls are established to prohibit activities or future land uses that might compromise the protectiveness of the remedy. Proprietary controls include deed restrictions, land use covenants, and conservation easements. These types of controls are moderately effective in the short and long term, however, they are typically not practical to implement until environmental investigations at the site are complete, a risk assessment has been performed, and a final remedy has been determined. Proprietary controls were not retained for inclusion in the remedial alternatives for this early interim action at the Site, but may be considered for OU1 properties when a final Site-wide record of decision is issued.
- Informational devices provide information and educate the community about the presence of contamination and measures to minimize exposure. Common informational devices are deed notices, educational advisories, and tracking systems. Deed notices are non-enforceable, informational documents filed in public land records providing important information about a given property. Educational advisories may include public health programs, community protective measures programs. These programs may provide the community with presentations, fact sheets, literature about lead and arsenic contamination and good housekeeping protective measures, and/ or community events aimed at increasing public awareness of contamination in the community and resources available. A public health program could also be aimed at increasing awareness of other resources such as blood lead testing through PCCHD. Informational devices are being implemented as part of the RI and through collaborating agencies and were not retained for possible inclusion in remedial alternatives for this early interim action at the Site; however, certain informational devices may be considered for OU1 properties when a final Site-wide record of decision is issued.

9.2.2 Dust

For indoor dust, containment controls include the process options of painting walls and applying plastic sheeting. Painting walls is highly effective in the short term at reducing exposure to contaminants on the walls. In the long term, painting is only moderately effective. Eventually the paint will begin to peel and chip, potentially exposing residents to contamination underneath. In addition, there may be additional exposures to contamination during painting if it is not done properly. While interior painting may be a beneficial containment control that has a moderate cost, Superfund is unable to address contaminants that are part of a structure or inside a building. Therefore, painting was not retained for further consideration as a component of the indoor dust remedy.

9.3 OU1 Interim Action Remedial Alternatives

9.3.1 Alternative 1

Alternative 1 is described as "No Action." The EPA is required by the NCP, 40 CFR §300.430(e)(6) to include and use the No Action Alternative as a baseline for comparison to other alternatives. Although emergency removal actions have been completed at the Site, residual risks to human health remain. Under the No Action Alternative, no remediation of residential soils or indoor dust within the Site would occur, meaning there were would be approximately 817 yards and 578 homes of 1,900 properties exceeding proposed cleanup levels.

This alternative is readily implementable, and the least expensive. However, the no action alternative does not reduce exposure, is not protective of human health and the environment and is therefore not effective.

Costs

Capital Cost: $0
Monitoring Costs/Year: $0
Present Value: $0
Excavation Volume: None
Implementation Time: None

9.3.2 Alternative 2

Alternative 2 is described as "Soil Removal and Replacement down to 12 Inches Below Ground Surface and Hotspot[2] Remediation with Indoor Dust Cleanup." This option consists of two main components, which are the residential soil remedy and the indoor dust remedy.

Alternative 2 – Residential Soil Remedy

Under Alternative 2, residential soils would be evaluated and removed if concentrations exceed the cleanup levels for lead or arsenic.

Soil removal and replacement is a three-stage process involving:

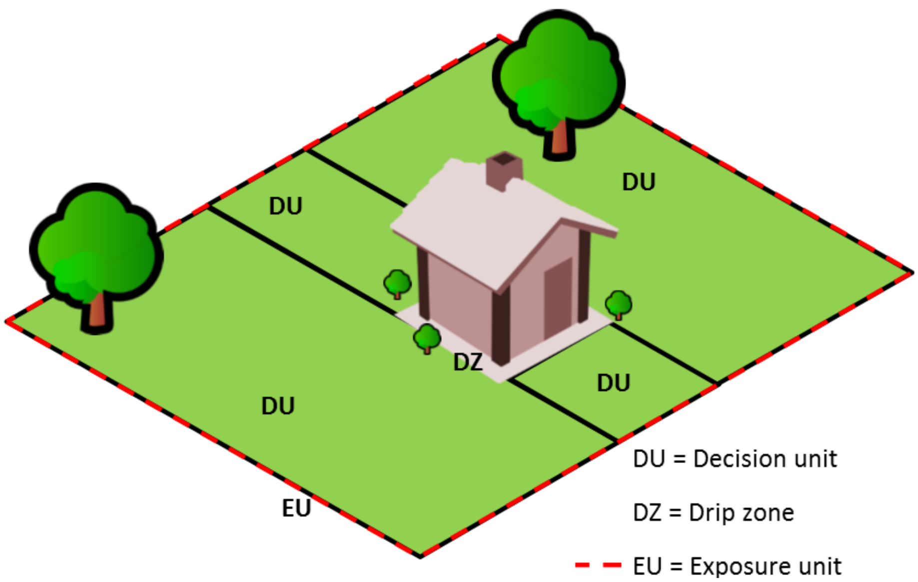
1. Excavation of contaminated soils,
2. Disposal of excavated materials at an appropriate offsite location, and
3. Replacement with clean soils. Where contamination is left in place below the depth of the excavation that exceeds the cleanup levels, a visible barrier/marker material will be placed, such as snow fence or geotextile.
4. The first step is to evaluate contamination levels down to 18 inches, and look at each area-weighted average contamination level at 0-1, 1-6, 6-12 and 12-18 inches across the entire yard (i.e., the entire exposure unit (EU)). Soil will be removed when the area-weighted average for any interval from 0-12 inches exceeds the corresponding arsenic or lead cleanup level. If the area-weighted average contamination level for the 12-18-inch interval exceeds the lead or arsenic cleanup level, a barrier (geotextile or snow fence) would be placed at the bottom of the 12-inch excavation prior to covering the area with clean soils. Play areas and gardens are initially included in the area-weighted averaging but will also be evaluated separately against cleanup levels. If gardens or play areas exceed the cleanup levels, soils in those DUs will be removed down to the depth of contamination or a maximum of 24 inches, which is consistent with the EPA's 2003 *Superfund Lead-Contaminated Residential Site Handbook*. A visible barrier also will be placed at

[2] A Hotspot is defined as areas having high levels of contamination. This is also used interchangeably with Not-to-Exceed (NTE) levels for this proposed plan.

the final excavation level of 18 inches for Hotspot/NTE DUs, or 24 inches for gardens and play areas, if confirmation soil sample results are greater than PRGs.

5. Based on soil sampling data EPA has obtained to date, EPA believes approximately 817 yards out of 1,900 properties may require cleanup down to 12 inches below the ground surface.
6. In addition, where any DUs[3] (e.g., side yard, front yard, back yard, play area, garden, etc.) has soil contamination above the Hotspot/Not to Exceed (NTE) level of 1,000 ppm of arsenic, or 1,918 ppm lead, at any depth sampled, that soil will be removed down to a maximum depth of 18 inches. Based on data to date, approximately 5-6 yards out of 1,900 properties may require a Hotspot or NTE cleanup; however, these properties may nevertheless be more thoroughly cleaned up due to their yard average concentrations exceeding cleanup levels.
7. Subsurface soils between 12 inches and 18 inches where averages exceed the cleanup levels, but are less than the Hotspot/NTE would remain in place beneath the visible barrier (geotextile or snow fence). ICs would be required for these properties but are not included in this I-ROD due to the interim nature of the remedy. Institutional controls will be considered in a final Site-wide record of decision.

Figure 4: Decision Unit/Exposure Unit Description



<u>Alternative 2 – Indoor Dust Remedy</u>

Under Alternative 2, indoor dust would be evaluated and cleaned up if concentrations exceed the selected dust cleanup levels for lead or arsenic. Removal of contamination from indoor surfaces may be accomplished by cleaning contaminated surfaces or by removing and replacing contaminated surfaces. Cleaning interior surfaces can be accomplished by a variety of conventional wet cleaning techniques, including wet mopping floors, washing walls, wiping down or washing counters, furniture, and decorations, shampooing carpets, etc., and HEPA vacuuming. Further, if the contamination in contaminated carpets cannot be cleaned, it will be addressed by removal and replacement or other best management practices.

In many cases, indoor lead dust cleanups will be coordinated with a soil cleanup; however, a small percentage of homes receiving indoor dust cleanups will not require outdoor soil cleanups because arsenic and lead in soils do not exceed the soil cleanup levels. This is because people generally spend a

[3] A typical residential property is comprised of 5 decision units (DU) – one for each side yard, one for each of the front and backyards, and one for the drip zone.

significant time indoors, so the overall risk of exposure to smelter-related contamination may be higher for dust inside these homes than for soil outside the homes.

Based on sampling data EPA has obtained to date, an estimated 30% of the properties, or approximately 578 homes, in the study area will require an indoor dust cleanup.

<u>Costs</u>
Total Costs: $42,991,000
Capital Cost: $41,196,100
Operational & Functional Costs/Year: $73,500 Year 1 and $273,700 Years 2 -7
Monitoring Costs: Vary annually – Years 2-8 Total: $79,200
Present Value: $ 34,435,379
Approximate Excavation Volume: 197,000 cubic yards
Implementation Time: 8 years

9.3.3 Alternative 3 (Preferred Alternative)

Alternative 3 is described as “Soil Removal and Replacement to 18 Inches Below Ground Surface with Indoor Dust Cleanup.” This option consists of two main components, which are the residential soil remedy and the indoor dust remedy.

<u>Alternative 3 – Residential Soil Remedy</u>

Under Alternative 3, residential soils would be evaluated and removed down to 18 inches if concentrations of contaminants in those soils exceeded the cleanup levels for lead or arsenic.

Soil removal and replacement is a three-stage process involving:

1. Excavation of contaminated soils,
2. Disposal of excavated materials at an appropriate offsite location, and
3. Replacement with clean soils to either 12 or 18 inches. In cases where contamination that exceeds the cleanup levels is left in place below 18 inches, a visible barrier/marker material will be placed, such as snow fence or geotextile.

Figure 5 in the Appendix provides a flowchart that describes the Alternative 3 soil cleanup.

The first step is to evaluate contamination levels down to 18 inches, and look at each area-weighted average contamination level at the different sampling intervals, that is, depths of 0-1, 1-6, 6-12, and 12-18 inches across the whole yard. Soil cleanup will be done where the area-weighted average for any interval from 0-18 inches across the entire yard (i.e. EU) exceeds the corresponding arsenic or lead cleanup level. For properties where the area-weighted average contamination level for any of the sampling intervals above 12-18 inches require cleanup, but the 12-18-inch interval does not, excavation would extend only to 12 inches.

For properties where the area-weighted average contamination level for the 12-18-inch interval exceeds the cleanup levels, excavation would extend down to 18 inches. In addition, confirmation sampling would be performed at the 18-inch depth and a visible barrier (geotextile or snow fence) would be put in place if contaminant concentrations in the remaining soil still exceeded cleanup levels. Soils in play areas and gardens are initially included in the area-weighted averaging, but they are also evaluated separately when compared to cleanup levels. In addition, any DUs having soil contamination above the Hotspot/NTE level of 1,000 ppm of arsenic or 1,918 ppm lead at any depth sampled will be removed to a maximum depth of 18 inches. A visible barrier will be placed at the final excavation depth of 18 inches for Hotspot/NTE DUs, or 24 inches for gardens and play areas, if confirmation soil sample results show that contamination in soils left in place are greater than cleanup levels. Based on sampling data EPA has obtained to date, approximately 5-6 yards out of 1,900 properties may require a Hotspot or NTE cleanup; however, these properties may be fully remediated if their yard average concentrations exceed the cleanup level.

Based on sampling data EPA has obtained to date, this alternative would result in removing and replacing all soil from 817 yards to 12 inches, with excavation to 18 inches at 195 of the 817 yards.

<u>Alternative 3 – Indoor Dust Remedy</u>

Under Alternative 3, indoor dust would be evaluated and cleaned up if concentrations of contaminants exceeded the dust cleanup levels for lead or arsenic. Removal of contamination from indoor surfaces may be accomplished by cleaning contaminated surfaces or by removing and replacing contaminated surfaces. Cleaning interior surfaces can be accomplished by a variety of conventional wet cleaning techniques, including wet mopping floors, washing walls, wiping down or washing counters, furniture, and decorations, shampooing carpets, etc., and HEPA vacuuming. If the contamination in carpets cannot be cleaned, it will be addressed by removal and replacement or other best management practices.

In many cases, indoor lead dust cleanups will take place in coordination with a soil cleanup; however, a small percentage of homes that receive indoor dust cleanups will not require outdoor soil cleanups because the arsenic and lead in their soils do not exceed the soil cleanup levels. This is because people generally spend a significant time indoors, so the overall risk of exposure to smelter-related dust contamination may be higher in some homes than the risk of exposure to contamination in their yard soil.

Based on sampling data EPA has obtained to date, an estimated 30% of the properties, approximately 578 homes, in the study area will require an indoor dust cleanup.

<u>Cost</u>

Total Costs: $45,623,500
Capital Cost: $43,828,600
Operational & Functional Costs/Year: $73,500 Year 1 and $273,700 Years 2 -7
Monitoring Costs: Vary annually – Years 2-8 Total: $79,200
Present Value: $ 36,526,699
Approximate Excavation Volume: 220,000 cubic yards
Implementation Time: 8 years

9.4 Common Elements and Distinguishing Features of Each Alternative

With the exception of the No Action Alternative, the remaining two alternatives include the common elements of a three-stage process for soil removal and replacement for residential properties in OU1 involving:

1. Excavation of contaminated soils,
2. Offsite transport, and disposal of contaminated soils in compliance with all applicable Federal and State requirements, and
3. Replacement with clean soils to either 12 or 18 inches. In cases where contamination that exceeds the cleanup levels is left in place, a visible barrier/marker material will be placed, such as snow fence or geotextile.

Alternatives 2 and 3 share the special considerations for garden and play area soil cleanups, which would ensure soil removal and replacement to 24 inches if soils exceed cleanup levels in those DUs.

Alternatives 2 and 3 also share that indoor dust in OU1 residences would be evaluated and cleaned up using a variety of methods if concentrations exceed the dust cleanup levels for lead or arsenic. Both alternatives estimated that 578 homes may require indoor dust cleanups.

Although the FFS estimates and assumptions for Alternatives 2 and 3 indicated that residents would be moved into temporary lodging (typically a hotel) for 3 and 4 days during soil removal and replacement, it is probable that soil cleanup can be safely accommodated without residents needing to leave their homes. However, indoor dust cleanups under either Alternatives 2 and 3 would require the EPA to provide for the temporary relocation of residents to a hotel for an average of 3 days.

A distinguishing feature of Alternative 3 includes in-situ characterization of the soil at the final excavation depth (18 inches) to determine if ICs will be necessary as part of the final residential soils remedy. Full removal down to 18 inches normally allows the remediated yard to return to unrestricted use.

An additional key distinguishing feature of Alternative 3 is that an estimated 195 of the 817 properties that have contamination above cleanup levels between 12 and 18 inches would get that additional volume removed. The estimated additional volume of soil removed for Alternative 3 is only 23,000 cubic yards. Overall, the additional present value cost for Alternative 3 is estimated to be $2,091,320.

For Alternatives 2 and 3, residents and property owners will receive a cleanup completion letter, which will describe the work done, whether any contamination exceeding the cleanup levels or NTE levels was left in place for any portion of the yard, the yard restoration requirements and warranty period for new grass, trees, shrubs, other vegetation and landscaping materials, and recommendations or requirements, if needed, to maintain long-term protectiveness of the cleanup. ICs will be needed for properties where contaminated soil is left in place above levels safe for unlimited use and unrestricted exposure. Although the need for ICs at specific properties and what kind of ICs may be needed will be evaluated, the public will have an opportunity to review and comment on that portion of the remedy as part of the final ROD for OU1. Institutional controls developed for OU1 will comply with the Colorado Environmental Covenant Statute, C.R.S. §§ 25-15-317 et seq.

EPA will monitor the cleanups for a minimum of one year to ensure compliance with the restoration requirements and warranty. This one-year period is also called the operational and functional (O&F) period. If contaminated soil is left in place above levels considered acceptable for unlimited use and unrestricted exposure, EPA will conduct five-year reviews in cooperation with the state and local authorities to evaluate the long-term effectiveness of the cleanup.

9.5 Expected Outcomes of Each Alternative

Removal and replacement of contaminated soils in residential areas is an accepted cleanup approach which uses readily available equipment and standardized procedures. This process is readily implementable and provides immediate protection and permanence by removing soil in accessible areas of a property. Residential use of the properties will continue under either Alternative 2 or 3.

Alternative 2 will not remove soils that exceed the cleanup levels below 12 inches, although EPA’s 2003 *Superfund Lead-Contaminated Residential Site Handbook* recommends a minimum 12 inches of clean soil replacement because typical activities of children and adults in residential properties do not extend below a 12-inch depth and this amount of clean soil will provide an adequate barrier and prevent direct human contact and exposure to contaminated soil left at depth.

Alternative 3 will remove additional volumes of soil above the cleanup levels from 12 to 18 inches. The nominal additional costs will reduce future IC and monitoring costs associated with leaving that contaminated material in place, Removal to 18 inches may also prevent the need for placing subsurface barriers or markers, or for obtaining environmental covenants or easements. Removal down to 18 inches may allow the remediated yard to return to unrestricted use. Under Alternative 3, visible barriers will be installed if contamination above cleanup levels remain at 18 inches or 24 inches (i.e., in gardens and play areas).

The timeframes to achieve cleanup objectives are similar for both alternatives, since removal/excavation of soils, soil replacement, resodding/reseeding/other vegetation or landscaping placement, and indoor dust cleanups will be similar for most residential properties.

Individual property cleanups will take an average of one week; however, with an estimated average of 130 soil cleanups and 92 indoor cleanups per year, the estimate to complete the initial soil cleanups of priority properties, then the remaining phases of the OU1 residential cleanups is 8 years. This estimate includes ongoing evaluation during construction years 2 through 7 regarding whether properties meet the O&F criteria. Additionally, it is anticipated that any properties with contaminated soil left in place will require operations and maintenance (O&M) that may take six to seven years, beginning in construction year 2. These estimates and time periods depend on available annual cleanup funding.

Section 10: Summary of Comparative Analysis of Alternatives

The NCP regulations at 40 CFR §300.430(e)(9)(iii) require EPA to evaluate each remedial alternative according to specific criteria. The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative to ensure selection of remedies offering the most effective and efficient means of achieving protective site cleanup goals. There are nine criteria by which feasible remedial alternatives are evaluated. While all nine criteria are important, they are weighed differently in the decision-making process depending on whether they describe or involve protection of human health and the environment or compliance with federal or state statutes and regulations (threshold criteria), a consideration of technical or socioeconomic merits (primary balancing criteria), or the evaluation of non-EPA reviewers that may influence an EPA decision (modifying criteria).

The NCP criteria are:

<u>Threshold Criteria</u>

Alternatives must, at a minimum, meet the first two criteria to be eligible for selection as the preferred alternative.

1) Overall Protection of Human Heath and the Environment considers whether or not an alternative provides adequate protection by eliminating, reducing, or controlling unacceptable risks.
2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARS) considers whether or not an alternative will meet all federal or state standards required by environmental laws or whether there is justification for waiving the standards.

<u>Primary Balancing Criteria</u>

The primary balancing criteria are used to weigh effectiveness and cost tradeoffs among alternatives and the main technical criteria upon which the alternative evaluation is based.

3) Reduction of Toxicity, Mobility, and Volume through Treatment indicates EPA's preference for alternatives that include treatment processes to lower or eliminate the hazardous nature of material, its ability to move in the environment, and the amount left after treatment.
4) Long-Term Effectiveness and Permanence considers the long-term effectiveness and permanence of maintaining the protection of human health and the environment after implementing each alternative.
5) Short-Term Effectiveness considers the effect of each remedial alternative on the protection of human health and the environment during the construction and implementation phase.
6) Implementability considers the technical and administrative feasibility of implementing each alternative and the availability of the services and materials required during implementation.
7) Cost considers construction costs as well as long-term operation and maintenance costs of each alternative by considering whether costlier alternatives provide additional public health benefits for the increased cost.

Modifying Criteria

The last two criteria are used to determine whether the concerns of the State and the public should modify EPA's approach to the early interim action cleanup of OU1.

8) State Acceptance considers whether the State agrees with, disagrees with, or has no comment on EPA's preferred alternative.

9) Community Acceptance considers the concerns or support the public may offer regarding each alternative. EPA will evaluate community acceptance of cleanup alternatives after receiving public comment on the propose plan.

EPA Region 8 evaluated the three remedial alternatives set out in EPA's July 13, 2017 proposed plan against the threshold and balancing criteria specified in the NCP at 40 CFR §300.430(e)(9)(iii).

The No Action alternative is not evaluated in the comparative analysis but is included as a baseline for comparison to the two other alternatives. Under the no action alternative, no steps would be taken to remediate residential soils or indoor dust within the Site. Based on results from the first 302 properties sampled, selection of this alternative would leave lead or arsenic in soil exceeding PRGs at 133 properties. Assuming that the current sample population is generally representative of the study area as a whole, approximately 43% of the 1,900 properties in the study area are likely to have concentrations of arsenic or lead in soil exceeding PRGs. Selection of this alternative could be expected to leave arsenic or lead in soil exceeding clean up levels in 817 of 1,900 yards. For dust cleanups, it may leave approximately 578 homes, that is, about 30% of 1,900 properties in the study area without a dust cleanup.

This alternative is readily implementable and inexpensive. However, the no action alternative would not meet the RAOs for arsenic and lead, is not protective of human health and the environment, and is therefore not effective.

Due to the limited number of alternatives in this ROD, the comparative analysis discussion below is brief.

10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

All of the alternatives, except for the no-action alternative, are protective of human health and the environment by eliminating, reducing or controlling risks posed by the Site. Alternative 1, No-Action, would not be protective of human health. Since Alternative 1 does not meet this threshold criterion, it was not analyzed further.

Both Alternatives 2 and 3 are considered protective of human health and the environment; however, the overall protection of human health increases as the soil clean up depth increases to 18 inches. Alternative 2, Soil Removal and Replacement to 12 Inches Below Ground Surface and Not to Exceed (NTE) Area Remediation with Indoor Cleanups as Needed would be protective of human health since it provides for removal of soil from the upper 12 inches below ground surface where concentrations are above 350 ppm lead and 61 ppm arsenic. Based on data to date, approximately 817 yards out of 1,900 properties may require cleanup to 12 inches. In addition, Alternative 2 also provides hotspots, or any DU having soil concentrations greater than the not to exceed (NTE) values of 1,000 mg/kg arsenic or 1,918 mg/kg lead at any depth sampled, will be removed to a maximum depth of 18 inches. Based on data to date, approximately 5-6 yards out of 1,900 properties may require a hotspot cleanup; however, these properties may be more fully remediated due to the yard average concentrations exceeding the cleanup levels. The EPA's 2003 *Superfund Lead-Contaminated Residential Sites Handbook* suggests that 12 inches of clean replacement fill is typically sufficient to prevent direct exposure. The rationale is that with the exception of gardening, the typical activities of children and adults in residential properties do not extend below 12 inches below ground surface. The *Superfund Lead-Contaminated Residential Sites Handbook* indicates that a 24-inch barrier normally is necessary to prevent contact of contaminated soil at depth with plant roots, root vegetables, and clean soil that is mixed via deep rototilling.

Play areas and gardens were initially included in the area-weighed averaging but were also evaluated separately when comparing to Site cleanup levels. If the measured soil concentration in a garden or play area exceeds the arsenic or lead cleanup levels at any depth, soils in that DU will be removed down to 24 inches. Alternative 2 would increase protectiveness from soil contamination for residents of an estimated 817 homes and protectiveness from indoor dust contamination for residents of an estimated 578 homes.

While similar, Alternative 3, Soil Removal and Replacement to 18 Inches Below Ground Surface with Indoor Cleanups as Needed, would protect residents from 195 of the 817 homes from soil contamination that is also above the cleanup levels between 12 to 18 inches. Alternative 3 also provides hotspot removal down to 18 inches below ground surface if concentrations exceed the NTE values. In addition, Alternative 3 provides that play area and garden cleanups of soils in those DUs will take place down to 24 inches where the arsenic or lead concentrations at any depth exceed the cleanup levels.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d) of CERCLA and NCP regulations at §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and State requirements, standards, criteria, and limitations, which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified in a timely manner and which are more stringent than Federal requirements may be considered applicable.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

All alternatives, except the no action alternative would comply with the ARARs identified in Table 17 in the Appendix. The ARARs are presented by media of concern and by Federal or State requirements that may apply at the Site. As work progresses and more information is gathered, the list of ARARs may be modified.

In addition to ARARs, EPA has developed another category of requirements, known as “to-be-considered” (TBCs) that include non-promulgated criteria, advisories, guidance, and proposed standards issued by federal or state governments. TBCs are not potential ARARs because they are not promulgated or enforceable. TBCs are useful for interpreting ARARs, and where there are no ARARs. Identification of TBCs is not mandatory, but EPA Region 8 used them to evaluate and determine the necessary level of cleanup at this Site for protection of human health or the environment.

Both Alternatives 2 and 3 will attain their respective federal and State ARARs; including but not limited to Colorado Regulations pertaining to solid waste management and disposal and fugitive dust emissions resulting from remedial action. Alternative 2 would leave some residential soils with contamination above the cleanup levels below 12 inches.

For the selected remedy, ICs may be needed for properties where contaminated soil is left in place above levels safe for unlimited use and unrestricted exposure. Although the need for ICs at specific properties and what kind of ICs may be needed will be evaluated, the public will have an opportunity to review and comment on that portion of the remedy as part of the final Record of Decision (ROD) for OU1. ICs developed for OU1 will comply with the Colorado Environmental Covenant Statute, C.R.S. §§ 25-15-317 et seq. and will be documented in the final OU1 ROD. Therefore, there are no waivers for this OU1 early interim action.

10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Each alternative, except the No Action alternative, provides some degree of long-term protection. Alternative 2 is considered adequately effective with regard to this criterion as it meets the minimum recommendations of the EPA 2003 *Superfund Lead-Contaminated Residential Sites Handbook,* which suggests that 12 inches of clean replacement fill is typically sufficient to prevent direct exposure. The rationale behind this is that with the exception of gardening, the typical activities of children and adults in residential properties do not extend lower than 12 inches below ground surface. The Residential Sites Handbook indicates that a 24-inch barrier normally is necessary to prevent contact of contaminated soil at depth with plant roots, root vegetables, and clean soil that is mixed via deep rototilling. However, Alternative 2 may leave some contaminated soils at depth, so Alternative 3 provides for a greater level of long-term effectiveness and permanence because of the additional depth of soil removal in regular DUs and low likelihood of contact with contaminated soils.

Both Alternatives 2 and 3 provide long-term effectiveness and permanence in gardens and play areas due to the greater depths of soil removal in those special use DUs. Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of any of these alternatives if hazardous substances remain in residential soils in concentrations above cleanup levels.

10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

None of the alternatives include treatment as a component of the remedy to reduce contaminants' harmful effects or ability to move in the environment because Alternatives 2 and 3 involve removal of contaminated soils and replacement with clean soils.

10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved. Alternative 1, No Action, would not be an effective alternative because current risks from inhalation of the air-entrained particles/dust; ingestion (eating or drinking); and dermal contact (or direct physical contact) would continue to exist.

The timeframes to achieve cleanup objectives are similar for both Alternatives 2 and 3, since removal/excavation of soils, soil replacement, resodding/reseeding/other vegetation or landscaping placement, and indoor dust cleanups will be similar for most residential properties.

Individual property cleanups will take an average of one week; however, with an estimated average of 130 soil cleanups and 92 indoor cleanups per year, the estimate to complete the initial soil cleanups of priority properties, then the remaining phases of the OU1 residential cleanups is 8 years. This estimate includes ongoing evaluation during construction years 2 through 7 regarding whether properties meet the O&F criteria. Additionally, it is anticipated that any properties with contaminated soil left in place will require O&M that may take six to seven years, beginning in construction year 2. These estimates and time periods depend on available annual cleanup funding.

There would be potential risks to construction workers during excavation and removal of soils with both Alternatives 2 and 3. However, air monitoring, on-site and at the study area boundary, engineering controls, and worker exposure controls will control the potential for exposure to Site contaminants. Federal and State ARARs will also be met to mitigate for any adverse on- or off-site impacts from the cleanup action.

10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability for services and materials, administrative feasibility, and coordination with other government entities are also considered.

Under Alternatives 2 and 3, the removal and replacement of contaminated soils in residential areas is an accepted cleanup approach which uses readily available equipment and standardized procedures. This process is readily implementable and provides immediate protection and permanence by removing soil in accessible areas of a property. Residential use of the properties requiring cleanups will continue under either Alternative 2 or 3.

All materials and services required for implementation should be readily and commercially available. Potential difficulties with implementation and O&M will be evaluated and resolved during the design phase of the cleanup action. Coordination with the appropriate State and Local authorities will be required during the design phase of the cleanup action to determine such things as haul routes for contaminated materials and cleanup supplies.

ICs will be implemented with the final ROD; however, the need for, and type of, ICs will be evaluated. The public will have an opportunity to review and comment on that portion of the remedy as part of the final ROD for OU1. Institutional controls developed for OU1 will comply with the Colorado Environmental Covenant Statute, C.R.S. §§ 25-15-317 et seq.

EPA will monitor the cleanups for a minimum of one year to ensure compliance with the restoration requirements so that the property-specific warranty is readily implementable and to confirm property-specific O&F criteria have been met.

10.7 Cost

Cost includes estimated capital and annual operation and maintenance costs. Cost is calculated as the present worth cost, which is the total cost of an alternative over time in terms of today’s dollars.

The estimated present worth costs for Alternatives 2 and 3, at a 7% discount rate, are $34,435,379 and $36,526,699, respectively. Alternative 3 costs represent a nominal difference in cost for the additional level of protectiveness to human health and the environment. The additional amount of time required at the estimated 195 properties requiring the soil removal from 12 to 18 inches also represents minimal additional construction costs. Placement of a visible barrier, any associated ICs, and long-term O&M costs are anticipated to be lower in the long-term for Alternative 3 since more contaminated soil will be removed from properties. This is likely to increase the number of properties that will meet unlimited use and unrestricted exposure criteria. The slightly costlier Alternative 3 adds value since it provides additional public health benefits, lower IC costs, and lower O&M costs for the increased cleanup costs.

10.8 State Acceptance

For the Colorado Smelter Site, the EPA, as lead agency, has coordinated all Site activities with the CDPHE throughout this project. The CDPHE, as the support agency, has participated in the development of, and has commented on the alternatives presented in the proposed plan and the i-ROD. State comments and EPA responses on those documents are not included in the Responsiveness Summary. EPA, as a partner to the CDPHE, acknowledged the State's concerns and comments through revisions to those documents.

CDPHE expressed its support and concurs with EPA's decision to select Alternative 3 to address the risks to the citizens of Pueblo, Colorado and restoring the Site to its fullest potential. If the interim remedy determines that ICs are necessary, EPA agrees with the CDPHE regarding coordination with the City of Pueblo to begin the process of implementing ICs where appropriate.

10.9 Community Acceptance

This criterion evaluates whether the local community agrees with EPA's analyses and preferred alternative.

The EPA encouraged public review and comment on the proposed plan by issuing the plan with supporting documents in the Administrative Record. In order to provide the community with an opportunity to submit written or oral comments, the EPA released the plan on Friday July 14, 2017, initiating a 30-day public comment period. One public meeting was held on Wednesday August 9, 2017 and two availability sessions were held Thursday August 10, 2017. Upon receiving a single request, the EPA extended the comment period an additional 30 days. The comment period closed on September 15, 2017.

The community generally supports the interim cleanup action selected by the EPA. The community is also supportive of a comprehensive, multi-pathway approach to reducing lead exposures at the Site. The community strongly desires that the cleanup start and be completed as rapidly as possible.

Section 11: Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address principal threats posed by a site wherever practical. Principal threats for which treatment is most likely to be appropriate include liquids, areas contaminated with high concentrations of toxic compounds, and highly mobile materials (40 CFR § 300.430(a)(1)(iii)(A)).

The principal threat concept is applied to the characterization of source material at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to ground water, surface water, or air, or acts as a source for direct exposure. EPA has defined principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. EPA has not identified any Principal Threat Wastes in the soils or indoor dust at the residential areas of OU1.

Section 12: Selected Remedy

Based on the Comparative Analysis of Alternatives, which included State and Community input and acceptance, the EPA has selected the Alternative 3 remedy for the OU1 early interim action.

12.1 Summary of the Rationale for the Selected Remedy

This i-ROD documents the EPA Region 8 selection of Alternative 3, "Soil Removal and Replacement to 18 Inches Below Ground Surface with Indoor Dust Cleanup" for this early interim action at the Colorado Smelter Superfund Site. This remedy selection is based on RI soil sample data from 302 homes and dust sample data from 102 homes, which was collected from May 2015 – June 2016. EPA evaluated these samples and made a determination that the levels of arsenic and lead found in some OU1 residential properties' samples show there is an increased risk of exposure to elevated levels of smelter-related lead and arsenic in residential soils and indoor dust at some homes.

During 2016 and the first half of 2017, EPA completed indoor dust cleanups at 27 homes within the OU1 study area as part of an emergency removal action. EPA's residential soil and indoor dust sample results show concentrations of arsenic and lead above health-based screening levels and Site-specific cleanup levels (formerly PRGs). This emergency indoor dust removal response effort was deemed necessary due to the high levels of smelter-related lead in interior dust and soil and the risk to human health predicted by the IEUBK model. Residential yard soil cleanups at these locations should occur as soon as possible to minimize recontamination. Figure 6 in the Appendix identifies the locations of homes where indoor dust has already been remediated.

It is also critical that additional dust and soil cleanups begin as soon as possible at additional residential properties in the study area, based on RI data that shows the potential for residents to have unacceptable risks due to exposure to lead and arsenic contamination which warrants action under Superfund. While not the basis for this EPA action, elevated blood lead levels in some residents and community interest to complete the Superfund process as quickly as possible also resulted in starting this early interim action prior to RI completion.

The primary smelter sources of contamination that EPA identified in the supporting risk evaluation for the FFS include:

- Fugitive dust and particulate air emissions from the historic smelter stack.
- Solid wastes such as slag and slag-impacted soils.
- Liquid wastes such as process solutions, acids, and rinsates from historic facility operations.

In addition, EPA recognizes there are other sources of lead and arsenic that may contribute to the overall risk for residents at the Site. EPA included the effects of these other sources of lead and arsenic in the risk evaluation but the Superfund cleanup authority is only able to address those sources of contamination that result from historic smelter operations. EPA's risk evaluation takes a more conservative approach to account for other sources of contamination that may affect residents. These other non-smelter sources of lead and arsenic in the community may include:

- The historic use of leaded gasoline;
- Household paint made before 1978; and
- The potential historic use of arsenical pesticides/herbicides.

Individuals may be exposed to Site contaminants through inhalation of particles of dust in the air; ingestion (eating or drinking); and dermal contact (direct physical contact). Long-lasting (chronic) exposure to lead, even at low levels, may cause subtle but harmful impacts to the central nervous system, which can affect learning and behavior. Over time, lead may cause more severe nervous system damage, anemia, kidney damage, brain damage, or at extremely high levels, seizures and even death. Children below 7 years of age, unborn children and pregnant women are especially susceptible to the toxic effects of lead; however, long-term exposure in adults may contribute to high blood pressure, kidney problems, and cognitive dysfunction. While lead is the primary COC, arsenic is also a concern.

EPA will perform a baseline HHRA when the full RI dataset is available to help us evaluate other risk pathways at the Site and to decide if additional cleanup is required for OU1. EPA will also re-evaluate the COPCs and PRGs with the full RI dataset.

As part of the ongoing RI, the local health department will continue to provide additional blood lead screening, healthy home risk assessments, health education, and outreach materials to residents in the study area to help people identify other sources of lead in and around their homes so they will be aware of them, and avoid, or manage contact with them.

12.1.1 Lead Analytical Results

The Pueblo field laboratory analyzed soils samples using a XRF. The DU average concentrations of lead in all depths of soils collected from the first 302 homes sampled ranged from 7.27 to 3,910 ppm. Dust samples from 102 homes were sent to an offsite laboratory and the lead concentrations in indoor dust from living areas have ranged from 8.2 to 2,060 ppm.

Current scientific literature provides evidence that adverse health effects are associated with blood lead levels less than 10 µg/dL. For this reason and to provide Colorado Smelter Superfund Site with the most thorough and health protective lead cleanup as possible, cleanup levels of 350 ppm and 275 ppm have been selected for lead in soil and dust respectively. Using the IEUBK model and Site-specific exposure parameters, the predicted blood lead level to be associated with 350 ppm lead in soil is 6.24 µg/dL.

12.1.2 Arsenic Analytical Results

EPA's investigations also found elevated levels of arsenic contamination in residential soils and indoor dust in homes above the State of Colorado Background levels of 11 ppm. Arsenic concentrations ranged from very low levels (4.3 ppm) to over 323 ppm in residential soil samples and from 1 to 47 ppm in indoor dust samples. Exposure to arsenic through inhalation of particles of dust in the air, and ingestion of, and dermal contact with soils, can cause a variety of health problems. Health effects linked with exposure to arsenic for a long time are an increased risk for some types of cancer such as skin, lung, bladder, kidney, and liver cancers.

The soil cleanup level for arsenic is 61 ppm, which is the noncarcinogenic RBC, was selected because the carcinogenic RBC of 12 ppm is below the calculated natural BTV of 12.7 ppm and is anticipated to also be below the Site-specific urban background.

12.2 Detailed Description of the Selected Remedy

The selected remedy represents an interim action based on the need for early interim action outdoor soil cleanups which may be necessary to achieve significant risk reduction quickly and to prevent further environmental degradation, while a final remedial solution is developed. The early interim action will include additional dust and soil cleanups at additional properties in the study area, based on RI data that shows the potential for residents to have unacceptable risks due to exposure to lead and arsenic contamination which warrants action under Superfund.

12.2.1 RAOs

EPA developed the following OU1-specific RAOs for arsenic and lead in residential soil and indoor dust in order to protect human health from lead and arsenic at the Site and to describe what the cleanup will accomplish. The principle RAO for the Colorado Smelter Site is to protect human health from Site-related contaminants, namely arsenic and lead. EPA considers current and reasonably anticipated future use of the site when determining RAOs. Based on current zoning of the Site, the reasonably anticipated future uses at most properties include residential use. Therefore, EPA has determined that residentially zoned property within OU1 should be remediated to meet residential land use criteria. Non-residential properties will be evaluated as part of future actions.

The RAOs described below will reduce exposure to elevated levels of arsenic and lead in soils and dust, thus reducing the potential for health impacts associated with elevated arsenic and lead.

<u>RAOs for Arsenic and Lead in Soil</u>

The RAOs for arsenic and lead in soil are intended to reduce human exposure to soils with contamination exceeding health based cleanup levels. The arsenic cleanup level is 61 milligrams per kilogram (ppm) and the lead cleanup level is 350 ppm. The Hotspot or NTE cleanup level for arsenic is 1,000 ppm and for lead is 1,918 ppm.

<u>RAOs for Arsenic and Lead in Indoor Dust</u>

Similarly, the RAOs for arsenic and lead in dust are intended to reduce human exposure to indoor dust exceeding the health based cleanup levels for arsenic and lead in indoor dust. The indoor dust arsenic cleanup level is 61 ppm and the indoor dust lead cleanup level is 275 ppm.

RAOs have not been developed for animals, plants and other such ecological receptors at the Site at this time. They will be developed as part of the Operable Unit 2 (OU2 – Former Smelter Area) RI and documented in a future OU-specific ROD.

12.2.2 Remedy Details

The selected remedy consists of two main components, including the residential soil remedy and the indoor dust remedy where arsenic or lead concentrations exceed Site-specific cleanup levels.

Soil removal and replacement is a three-stage process involving:

- Excavation of contaminated soils;
- Disposal of excavated materials at an appropriate offsite location; and
- Replacement with clean soils in most residential DUs to either 12, 18, or 24 inches.

In cases where contamination that exceeds the cleanup levels is left in place below 18 or 24 inches, a visible barrier/marker material will be placed, such as snow fence or geotextile.

Indoor dust cleanup involving:

- Conventional wet cleaning techniques, including wet mopping floors, washing walls, wiping down or washing counters, furniture, and decorations, shampooing carpets, etc.;
- HEPA vacuuming; and
- Contamination in contaminated carpets that cannot be cleaned with wet cleaning or HEPA vacuuming will be addressed by removal and replacement or other best management practices.

Other components include:

- In-situ characterization of the soil at the final excavation depth to determine if institutional controls (ICs) will be necessary as part of the final residential soils remedy;
- Property revegetation/landscaping;
- Development and delivery of cleanup completion letters for residents and property owners, which will describe:
  - The work done,
  - Whether any contamination exceeding the PRGs or Not to Exceed (NTE) levels was left in place for any portion of the yard,

- o The yard restoration requirements and one-year warranty period for new grass, trees, shrubs, other vegetation and landscaping materials, and
- o Recommendations or requirements, if needed, to maintain long-term protectiveness of the cleanup.

- Cleanup monitoring for a minimum of one year to ensure compliance with the restoration requirements and warranty; and
- Five-year review implementation in cooperation with the state and local authorities to evaluate the long-term effectiveness of the cleanup.

Although not a part of the remedy selected in this i-ROD, it should be noted that the following steps are anticipated if smelter-related soil contamination is left in place above levels considered acceptable for unlimited use and unrestricted exposure. They include:

- o Institutional Controls (ICs) for OU1 that complies with the Colorado Environmental Covenant Statute, C.R.S. §§ 25-15-317 et seq. will be evaluated.
  - Scheduling meetings with State and local government representatives,
  - Identifying need for ICs at specific properties, and
  - Identifying what kind of ICs may be needed.
- o Providing the public an opportunity to review and comment on that portion of the remedy as part of the final ROD for OU1.

12.3 Cost Estimate for the Selected Remedy

The estimated capital construction cost of the selected remedy is estimated at $43,828,600, as shown on Table 13. This is based on an estimate of the overall cost of $42,500 per residential property requiring a soil cleanup to 12 inches (Table 14), $56,000 per residential property requiring a soil cleanup to 18 inches (Table 15), and an estimate of $11,200 per residential property requiring an indoor dust cleanup (Table 16). The overall cost includes all construction and associated activities required to address the lead and arsenic contamination in the OU1 residential properties at the Site. Annual capital costs and the need for O&M will vary because the majority of properties will be cleaned up during years 1 -6; however, the total O&M estimate is $79,200. The total estimated remedial action cost is $45,623,500, which consists of the capital construction cost ($43,828,600) plus the total O&F ($1,715,700) and total O&M costs ($79,200). The total present worth costs discount rate is 7% and $36,526,699.

The information in this cost estimate and summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the design assistance/engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference (ESD), or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Table 13: Alternative 3 – Present Value

Year[1,3,4]		Capital Cost	Annual O&F Cost[5]	Annual O&M Cost[6]	Total Costs	Discount Factor at 7%[7]	Total Present Value Cost at 7%
0	2017	$1,789,900	$-	$-	$1,789,900	1.000	$1,789,900
1	2018	$7,006,450	$73,500	$-	$7,079,950	0.935	$6,573,785
2	2019	$7,006,450	$273,700	$1,000	$7,281,150	0.873	$6,257,155
3	2020	$7,006,450	273,700	$4,500	$7,284,650	0.816	$5,907,357
4	2021	$7,006,450	273,700	$7,900	$7,288,050	0.763	$5,565,881
5	2022	$7,006,450	273,700	$11,300	$7,291,450	0.713	$5,201,745
6	2023	$7,006,450	273,700	$14,700	$7,294,850	0.666	$4,861,444
7	2024	-	273,700	$18,200	$291,900	0.623	$180,140
8	2025	-	273,700	$21,600	$21,600	0.582	$84,936
	Total	**$43,828,600**	**$1,715,700**	**$79,200**	**$45,623,500**	**-**	**$36,526,699**

[1]Year 0: Assume 35 soil removals and 27 interior cleanups
[3]Years 1 – 6: Assumes 91.8 interior cleanups per year
[4]Years 1 – 6: Assumes 12-inch and 18-inch soil removals at 97.8 and 32.5 properties per year, respectively
[5]Assume 1-year of maintenance and monitoring during the Operational and Functional (O&F) Period
[6]Assume costs for post 1-year warranty period (after O&F), which includes some yard inspections and responding to community requests for information regarding cleanup and property restoration status.
[7]Discount Factor = 1/(1 + i)t , where i = 0.07, t = year (i.e. the present value of one dollar paid in year t at 7%)

12.3.2 General Assumptions Used as Basis for Cost Estimate

The unit costs for 12-inch and 18-inch soil removals, as well as indoor dust cleanups are shown in Tables 14-16. Assumptions include:

- Selected Remedy assumes soil removal to a depth of 12 inches at 622 properties; to a depth of 18 inches at 195 properties and indoor dust cleaning at 578 homes.
- Cost details are in 2016 dollars and soil removal unit costs are based on an average yard area of for a typical 5,000 square foot property undergoing either 12-inch or 18-inch soil removals and dust cleaning for a typical 1,500 square foot house plus basement.
- Estimated overall cost of $42,500 per residential property requiring a soil cleanup to 12 inches, $56,000 per residential property requiring a soil cleanup to 18 inches and an estimate of $11,200 per residential property requiring an indoor dust cleanup.
- Annual O&F Cost elements – assumed 1-year life cycle with: $45/month residential water bill; a 0.5-hour monthly yard inspection to assess condition of lawn, shrubs, and other restoration materials, including documentation and project management; and a $250 annual landscape repair allowance.
- Annual O&M Cost elements – assumed life cycle years 2 – 8; Assumed 10% of completed properties will require annual post-warranty yard inspection at $200.00; Assume response to community requests to be $5,200 per year at 100% completion, therefore the annual cost was prorated based on the number of properties completed during any given year (i.e. for 35 properties cleaned, the total annual cost is $200, at 817 properties completed the total annual cost is $5,200).
- Restoring Property Outside - conservative assumptions used to estimate costs include:
  - o Importing, grading, and compacting clean fill and topsoil,
  - o Installing sod and an irrigation system for 4,000 square feet,
  - o Providing costs for one-year of water to irrigate and sustain sod, seed, and other vegetation, and
  - o Providing a $250 allowance to replace flowers and shrubs.
- Restoring Property Outside excludes:
  - o House painting,
  - o House patching,
  - o Removal of existing concrete or asphalt pavement that is in good condition, and

- Costs for long-term institutional controls for properties left with contaminated soils lower than final excavation depth that exceed any cleanup levels.
  - Note that ICs are not anticipated to apply to the indoor cleanups because smelter-related contamination above cleanup levels will be addressed where needed, and
  - If post-cleanup indoor lead screening data indicate elevated indoor lead levels, the cause may be interior lead-based paint or other non-smelter sources.
- Soil removed is assumed to be nonhazardous waste under Subtitle C of RCRA and suitable for land disposal.
- 35% of the total volume of soil removed is assumed to require hand digging; the balance can be removed by machine.

12.3.3 Expected Outcomes of the Selected Remedy

The selected remedy will reduce health threats and increase protectiveness from the risk of exposure to elevated arsenic and lead in contaminated soil and dust through cleanups at residential properties in OU1 of the preliminary study area.

Individual property cleanups will take an average of one week; however, with an estimated average of 130 soil cleanups and 92 indoor cleanups per year, the estimate to complete the initial soil cleanups of priority properties, then the remaining phases of the OU1 residential cleanups is 8 years. This estimate includes ongoing evaluation during construction years 2 through 7 regarding whether properties meet the O&F criteria. Additionally, it is anticipated that any properties with contaminated soil left in place will require O&M that may take six to seven years, beginning in construction year 2. These estimates and time periods depend on available annual cleanup funding.All three neighborhoods within the Site are made up predominately of single-family residential homes, and that land use is not expected to change. Therefore, EPA has determined that residentially zoned property within OU1 should be remediated to meet residential land use criteria. Non-residential properties will be evaluated as part of future actions.

The Site-specific arsenic and lead cleanup levels chosen by EPA Region 8 are conservative and health protective. Therefore, they are not anticipated to change. EPA will perform a baseline HHRA when the full RI dataset is available to help us evaluate other risk pathways at the Site and whether any additional cleanup is required for OU1. EPA will also re-evaluate the COPCs and PRGs with the full RI dataset. A Site-specific background study will be conducted, because multiple other sources of metals are present in the environment both naturally and as a result of human activities. The Site-specific background study results will also be used to support the HHRA for the OU1 RI and for the Site at large. The background study results also will be used as part of the final COPC determination.

As part of the ongoing RI, it is expected that the local health department will continue to provide additional blood lead screening, healthy home risk assessments, health education, and outreach materials to residents in the study area to help people identify other sources of lead in and around their homes so they will be aware of them, and avoid, or manage contact with them.

Section 13: Statutory Determinations

Under CERCLA § 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions to the extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment through the elimination of contamination via removal and disposal of arsenic- and lead-contaminated residential soil and indoor dust. The selected remedy will eliminate sources of contamination that CERCLA authority allows EPA to address, namely smelter-related contamination in soils and dust, thus reducing the amount of metals residents are exposed to in their environment and homes.

For arsenic in soil and indoor dust, the noncarcinogenic RBC of 61 ppm was selected as the arsenic cleanup level. This level of 61 ppm was selected because the cancer RBC of 12 ppm is lower than the natural BTV of 12.7 ppm. It is also expected to be below the Site-specific urban background. This level, 61 ppm, is protective and conservative when compared to 120 ppm, which is the cancer risk of approximately one additional instance of cancer in 10,000 people (10^{-4}). This level is also consistent with EPA regulation in the NCP that establishes a range of acceptable risk as 10^{-4} to 10^{-6}, or a range of one excess cancer in 10,000 cases to one excess cancer in 1,000,000 cases.

Current scientific literature provides evidence that adverse health effects are associated with blood lead levels less than 10 µg/dL. For this reason and to provide Colorado Smelter Superfund Site with the most thorough and health protective lead cleanup as possible, cleanup levels of 350 ppm and 275 ppm have been selected for lead in soil and dust respectively. Using the IEUBK model and Site-specific exposure parameters, the predicted blood lead level to be associated with 350 ppm in soil is 6.24 µg/dL.

The implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts. Ecological risks will be addressed during the RI for OU2.

13.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 10.2 provides a detailed description of ARARs, TBC information and their respective roles in Superfund cleanups. As set forth in the NCP §300.430(f)(5)(ii)(B) and (C), the selected remedy will comply with federal and State ARARs that have been identified. EPA has not sought any waiver of any ARAR for the selected remedy. ARARs and TBC information are provided in Table 17 in the Appendix.

13.3 Cost-Effectiveness

The selected remedy is determined to be cost-effective. In making this determination, the following definition set forth in the NCP was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (40 CFR §300.430(f)(1)(ii)(D)). This was determined by evaluating the "overall effectiveness" of those alternatives that satisfy the threshold criteria. The selected remedy, Alternative 3, is estimated to cost $2,091,320 more than Alternative 2. The additional expense will provide greater long-term protectiveness and permanence, as well as greater short-term effectiveness. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs (Selected Remedy: Present Value: $36,526,699 vs. Alternative 2: Present Value: $ 34,435,379) to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and, hence, this alternative represents a reasonable value for the money to be spent.

13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP)

This action is an early interim solution because the OU1 RI is not complete. The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. While the selected remedy does not utilize treatment technologies, it is intended to provide permanent solutions for soil and dust contamination and is consistent with the anticipated final remedy for OU1. Of those alternatives that are protective of human health and the environment and comply with ARARs, the selected remedy provides the best consideration of the five balancing criteria, even though the remedy does not meet the statutory preference for treatment. or preference against off-site treatment and disposal. State and community acceptance were important considerations.

13.5 Preference for Treatment as a Principal Element

The selected remedy for this early interim action at OU1 of the Colorado Smelter Site does not satisfy the statutory preference for treatment as a principal element of the remedy because such large volumes of soils contaminated with lead and arsenic cannot be treated cost effectively, and there are technical limitations with treatment of arsenic-contaminated soils. Because treatment of soil lead in the residential areas was not found to be practicable or cost effective, this remedy does not satisfy the statutory preference for treatment as a principal element of this early interim remedy for OU1 of the Site.

13.6 Five-year Review Requirements

Because the selected remedy will leave some hazardous substances, pollutants, or contaminants in some on-site soils above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or continues to be, or will be, protective of human health and the environment (NCP §300.430(f)(4)(ii)).

Section 14: Documentation of Significant Changes

There are no additional significant changes as a result of the public comment period.

RESPONSIVENESS SUMMARY

Section 1: Stakeholder Issues and Lead Agency Responses

1.1 Overview

On July 14, 2017 EPA released the Early Action Interim Proposed Plan for the Colorado Smelter Superfund Site. EPA's preferred alternative in the proposed plan is Alternative 3, described as "Soil Removal and Replacement to 18 Inches Below Ground Surface with Indoor Dust Cleanup." This option consists of two main components, including the residential soil remedy and the indoor dust remedy.

EPA conducted a 30-day public comment period from July 14-August 14, 2017. A 30-day extension to the public comment period was requested and allowed, which closed September 15, 2017. EPA received written and oral comments during the comment period in which oral comments were provided during a public meeting on August 9, 2017 at the Pueblo City-County Health Department in Pueblo, CO. The comments received had various common themes addressing various elements for the selected remedies, and accordingly, have been summarized in accordance with these themes in order to provide overall responses. Judging from the comments received during the public comment period, residents along with local elected officials would, overall, strongly support *Alternative 3*. The community, in general, believes this alternative to be the most effective to protect public health and be implemented in a timely fashion.

1.2 Background on Community Involvement

Since early 2012, EPA has been actively engaged in the community. Meetings with the community between 2012 and early 2014 involved EPA, the State and local health departments, and the Agency for Toxic Substances and Disease Registry (ATSDR), and described the levels of arsenic and lead contamination identified in the 2011 Site Inspection Analytical Results Report which qualified the Site for the National Priorities List (NPL). Proposal to the NPL in May 2014 allowed EPA to receive larger amounts of funding for much more detailed characterization of the nature and extent of smelter-related contamination through the RI/FS process.

In December 2014, the Site was finalized to the NPL and by April 2015, the initial Community Involvement Plan (CIP) interviews and documentation were completed. The CIP supports communication between the community (in and around the Site), EPA, the State health department, and local health department, and encourages community involvement in Site activities. Listing of the Site also provided support for the community-led development of a Community Advisory Group (CAG), a CAG facilitator, Technical Assistance Support for Communities (TASC) support, and the participation of the Superfund Redevelopment Initiative and federal Partnership for Sustainable Communities in the Colorado Smelter Revitalization Project.

Monthly CAG meetings are advertised in the local paper and are attended by community members, EPA, State and local health department representatives, city and county representatives, and congressional representatives. Those meetings provide updates on:

- sampling and analysis status,
- cleanup status,
- outreach materials/Fact Sheets,
- health education, outreach, blood lead screenings and in-home lead risk assessments, and
- the Colorado Smelter Revitalization Project.

The CAG is an independent, non-partisan group consisting of a balance of diverse interests affected by and concerned about the Site and the cleanup process. The overarching goal of the group is to have an effective cleanup completed by 2019.

Currently, CAG meetings are typically held on the second Tuesday of each month from 5:30-7:30 p.m. at the Steelworks Museum, 215 Canal St., in Pueblo. These meetings are open to the public and are typically advertised in the Pueblo Chieftain the Friday before each meeting.

CIP interviewees defined an effective cleanup as:

- Not causing unacceptable health risk to residents or animals, regardless of their age or desire to play in the parks, garden in their yards, or dig for pirate treasure in the neighborhood;
- Restoring the habitat and preventing future ecological risk;
- Promoting the economic vitality of the neighborhood;
- Preserving the historical structures and integrity of the neighborhood; and
- Limiting personal liability related to the smelter remediation.

The community advisory group intends to assist in achieving this goal of an effective cleanup by 2019 by:

- Providing input to EPA and other government entities that play a role in the cleanup to improve decision making for all;
- Sharing information, ideas, and concerns; and
- Serving as a conduit to the larger community.

CAG members also provide information and feedback to EPA and State and local health departments as well as provide CAG workgroup updates to the larger CAG. EPA, the State health department, and the local health department also provides routine updates to city, county and congressional representatives.

EPA has established a local information repository at the Pueblo City County Library Rawlings (Main Branch) 100 E. Abriendo Avenue Pueblo, CO 81004 719-562-5600. Site records are also available at: EPA Superfund Records Center 1595 Wynkoop Street Denver, CO 80202-1129 To request copies of administrative record documents, call: 303-312-7273 or 800-227-8917 ext. 312-7273 (toll free Region 8 only)

1.3 Summary and Response to Local Community General Concerns and Questions

1) EPA received several comments supporting EPA's preferred alternative outlined in the proposed plan. Along with several comments that the comment period not be extended to enable cleanup work to begin as soon as possible and/or to secure funding.

   EPA Response: *On August 9, 2017 EPA convened a public meeting for the proposed plan in which local resident expressed their desire to have the 30-day public comment period extended. By law we are required to extend the comment period by a minimum of 30 days, if we receive the request in a timely manner. The extended public comment period closed on September 15, 2017. EPA thanks those that support our preferred alternative.*

2) EPA received a comment asking that local contractors be hired to implement the remedy

   EPA Response: *EPA, where possible, hires local contractors to help with the remedy. However, we can't direct our contractor on who they are to subcontract out work to. EPA does have a program called the Superfund Job Training Initiative which is a job readiness program that provides training and employment opportunities for people living in communities affected by Superfund sites. Many of these areas are Environmental Justice (EJ) communities – historically under-represented minority and low-income neighborhoods and areas burdened with significant environmental challenges. EPA's goal is to help these communities develop job opportunities that remain long after a Superfund site has been cleaned up.*

3) EPA received several comments/questions on where new soil for yard cleanups will originate from and where contaminated soil will be moved to.

EPA Response: *The location(s) for new barrow soil that will be used during yard remediation will be determined during the remedial design/remedial action phase of the Superfund process. The contractor conducting the remedial action work will determine the location that contains barrow soil that meets all applicable or relevant and appropriate requirements (ARARs) of other federal and state environmental and public health statutes.*

4) EPA received several comments on the effect the Site has had on real estate transactions and values. Additionally, EPA received a few comments that EPA should waive property taxes and or reimburse homeowners for the perceived loss of property values.

   EPA Response: *Based on past cleanups, EPA believes that a Superfund remediation will have a beneficial impact on the community, including rebounding property values. Real estate agents, banks and other lenders, appraisers and public and private assessors may be able to help you with property value information. Local government agencies, such as your taxing authority or planning commission, may also be able to give you information on property values.*

   In our experience, the Superfund investigation and cleanup process helps inform real estate transactions, first by identifying the presence of any known contaminants of concern related to the site, and second by providing a means to clean up those contaminants to acceptable levels.

   While prospective buyers and sellers should direct real estate questions to local real estate professionals and lenders, EPA representatives can conduct presentations or provide information about site investigation and cleanup plans for the public including the real estate and lending community. In the past, EPA has also discussed site conditions and provided letters to potential lenders describing the current status of the Superfund site, as it pertains to a specific property being considered for a loan.

   These conversations or status letters have typically satisfied lenders and allowed loans to move forward.

   If a cleanup of a property is determined to be necessary (based on the sampling investigation), the EPA will provide a letter to property owners after cleanup completion confirming that the property meets EPA cleanup levels. The EPA recommends that this information be maintained by the property owner.

   In addition, if lenders are concerned about their potential liability, EPA can share information regarding the CERCLA lender liability exemption. Specifically, CERCLA section 101(20) eliminates owner/operator liability for lenders who hold ownership in a CERCLA facility primarily to protect their security interest in that facility, provided they do not "participate in the management of the facility." See CERCLA Lender Liability Exemption Q's & A's available at:

   http://www2.epa.gov/sites/production/files/documents/lender-liab-07-fs.pdf

   The Superfund law does not authorize EPA to compensate individual property owners for losses of property value. Studies have shown that Superfund cleanups have had an overall beneficial impact on the nearby community, including rebounding property values. For example, one 2013 study found that residential property values within three miles of Superfund sites increased 18.6-24.5% when sites were cleaned up and deleted from the National Priorities List.

   www.sciencedirect.com/science/article/pii/S0095069612001167

5) EPA received several comments regarding concerns on property damage resulting from yard remediation/questions and concerns on how properties will be restored during any yard remediation.

   EPA Response: *If a property requires remediation, EPA works with each individual homeowner to develop a yard clean-up plan specific to that property. The property plan identifies the areas that will be cleaned, what will be removed, and what will be replaced. EPA's practice is to restore a* *property to its previous conditions. Any grass, trees, shrubs, etc. that are removed during the cleanup will be replaced. If any part of the property is damaged during clean-up work, EPA and/or its contractor will be responsible to repair the damage that occurred. Residents and property owners will receive a cleanup completion letter, which will describe the work done, whether any contamination exceeding the PRGs or Not to Exceed (NTE) levels was left in place for any portion of the yard, the yard restoration requirements and warranty period for new grass, trees, shrubs, other vegetation and landscaping materials, and recommendations or requirements, if needed, to maintain long-term protectiveness of the cleanup.*

6) EPA received several comments with questions and concerns on the impacts heavy equipment used during remediation may have on roads as well as impacts related to drainage during storms.

   EPA Response: *EPA will work with local community, elected officials, and the appropriate city staff during the remedial design phase of the Superfund process to determine road capacity, schedule, along with other factors to mitigate disturbances in the community for any trucks or other heavy equipment used during remedial action.*

   Regarding storms and drainage, the impacts and ways to minimize exposures from Site contaminants will be considered during the remedial design for this early action.

7) EPA received several requests that EPA pave the alleys within the preliminary study area.

   EPA Response: *Paving of alleys was not an option presented in the interim-proposed plan. The Preferred Alternative discussed in the Proposed Plan will address contaminated soils and indoor dust at residential properties in the study area where arsenic and lead levels exceed the Preliminary Remediation Goals (PRGs). The goal of the preferred remedy is to reduce residents' exposure to unacceptable levels of lead and arsenic at these properties.*

8) EPA received several comments and concerns on EPA budget along with how much of the remedy costs are going to EPA salaries vs. clean-up costs.

   EPA Response: *EPA's budget is set through the congressional appropriation process. Due to the public health concerns identified at this site, EPA is committed to prioritize this site to receive funding for clean-up activities.*

9) EPA did receive a comment that was not supportive of the preferred alternative, and requested more technical information.

   EPA Response: *EPA noted the not supportive comment. EPA regularly shares all technical information pertaining to the site through a variety of ways. These include, monthly community advisory group meetings, the Technical Assistance Services for Communities contract at the site, and other small group meetings. Additionally, all supporting documents for the interim-proposed plan have been included in the administrative record and are readily available on EPA's website or located at the information repository.*

10) EPA received several comments regarding health concerns on exposure to lead and arsenic from contaminated soil and dust at the site.

   EPA Response: *EPA believes the early interim action presented in the interim-proposed plan is necessary because data collected from May 2015 through June 2016 show there is an increased risk of exposure to elevated levels of smelter-related lead and arsenic in residential soils and indoor dust at some homes. Additionally, an early interim action is necessary to reduce the likelihood that homes which received indoor dust cleanups will be re-contaminated from outdoor soils tracked in. It will also reduce human exposure to lead and other heavy metals in soils and indoor dust at other residential properties in the study area.*

11) EPA received several questions regarding the current preliminary study area including when a final boundary will be determined, and if EPA plans to sample more areas in the Grove neighborhood and adjunct levee along the Arkansas River.

    EPA Response: *The Superfund boundary has not been established for this site. A final boundary will be determined once EPA collects sufficient data to determine the nature and extent of contamination that was a result of past smelting activities at the Colorado Smelter. If EPA determines more sampling is necessary in other areas, EPA will work with the property owners to gain access and work to keep community members informed of EPA sampling and clean-up activities.*

12) EPA received several comments on the importance of sending sampling results to property owners in a timely manner in which the results are easily understood.

    EPA Response: *EPA understands the need to provide sampling results quickly to property owners. It's important for property owner to understand that EPA must follow the quality assurance project plan for sample collection, which includes laboratory analysis to have valid data specific to each property. This process takes approximately three to four months. EPA will continue to work with community members to simplify, where possible, results language in the sampling results package sent to homeowners.*

13) EPA received a comment related to liability concerns, specifically referencing page 11 in the interim- proposed plan "limiting personal liability related to smelter remediation."

    EPA Response: *Regarding the specific concern on page 11 of the interim-proposed plan, EPA was highlighting specific concerns from residents who were interviewed for the Community Involvement Plan. In determining whether to seek cost recovery for response costs for a residential property, the EPA would consider the "EPA's Policy Towards Owners of Residential Property at Superfund Sites" (July 3, 1991). This policy states as follows:*

    > *"Under this policy, EPA, in the exercise of its enforcement discretion, will not take enforcement actions against an owner of residential property to require such owner to undertake response actions or pay response costs, unless the residential homeowner's activities lead to a release or threat of release of hazardous substances resulting in the taking of a response action at the site."*

14) EPA received a comment that many homes in the preliminary study area are older and with that how we will protect foundations from damage.

    EPA Response: *It is the EPA's policy to leave the property in the same condition as before the EPA entered, whenever practicable. Should something happen to the property as a result of the EPA's actions, the EPA's contractors are required to carry comprehensive general liability insurance. In many cases if work around the foundation needs to conducted, hand tools rather than other types of machinery will be used, minimizing any risks of damaging the property.*

15) EPA received a comment asking to complete remedial work as quickly as possible to meet a five-year time frame which some community members ask for as part of recommending the site be placed on the NPL.

    EPA Response: *The interim-proposed plan recommends that EPA takes early action as soon as possible at additional properties in the study area, based on remedial investigation data that shows the potential for residents to have unacceptable risks due to exposure to lead and arsenic contamination which warrants action under Superfund. This proposed remedial action will expedite the time in which residential yard clean-ups are complete.*

16) EPA received a question on the warranty for any clean-up work completed on individual properties.

EPA Response: *EPA will monitor the cleanups for a minimum of one year to ensure compliance with the restoration requirements and warranty.*

17) EPA received a question when and how the agency will address commercial properties within the preliminary study area.

    EPA Response: *This interim-proposed plan addresses residential properties only, as that is where the greatest threat to exposures from smelter-related material exist. Commercial properties will be address once a full remedial investigation and feasibility study is completed.*

18) EPA received comments asking if contamination from the steel mill and other industrial activities has contributed to any contamination within the preliminary study area.

    EPA Response: *In some cases, other sources of contamination might be found, including from the steel mill..*

19) EPA received a comment stating the cleanup needs to address HVAC and ductwork inside homes.

    EPA Response: *EPA has taken this concern under consideration. A ductwork pilot study has been started to determine if any contamination from the vents/ductwork in homes re-contaminates homes where an indoor cleanup is needed or has already been completed.*

20) EPA received a comment that there may be mercury from past coal burning activities located on the slag pile of Operable Unit 2 and flowing into the Arkansas River.

    EPA Response: *This interim-proposed plan addresses Operable Unit 1 only, and mercury was not identified as a contaminant of concern to be addressed in the clean-up.*

21) EPA received a comment on the need for institutional controls for the preferred alternative.

    EPA Response: *ICs will be needed for properties where waste is left in place above levels safe for unlimited use and unrestricted exposure. The need for ICs at specific properties and what kind of ICs may be needed will be developed. The public will have an opportunity to review and comment on that portion of the remedy as part of the final ROD for OU1. Institutional controls developed for OU1 will comply with the Colorado Environmental Covenant Statute, C.R.S. §§ 25-15-317 et seq.*

22) EPA received a comment stating if Colorado State wants their state to be like the garden of Eden, the Colorado State must obey the laws of God concerning how to keep the land healthy. See Genesis 1:27-31; See also Moses 5:1-3

    EPA Response: *EPA is proposing this preferred alternative in the interim-proposed plan to address unacceptable exposures to lead and arsenic in residential properties related to wastes from the former Colorado Smelter. EPA is required to follow the CERCLA law commonly known as Superfund as it moves forward with any clean-ups.*

Section 2: Responses to Specific Technical and Legal Questions

2.1 Technical Comments Received from a Site Study Area Resident

EPA received technical comments regarding the proposed cleanup level of 61 ppm for arsenic and other background levels for arsenic.

EPA Response: *For arsenic in soil and indoor dust, the noncarcinogenic risk-based concentration (RBC) of 61 ppm was selected as the arsenic cleanup level. This level of 61 ppm was selected because the cancer RBC of 12 ppm is lower than the natural background threshold value (BTV) of 12.7 ppm. The overall chronic exposure RBC is the lower of the chronic exposure RBCs for carcinogenic and noncarcinogenic exposure, and assumes a target risk of 1E-05 (carcinogenic) and the target hazard quotient of 1 (noncarcinogenic); however, 12 ppm is lower than natural background, therefore 61 ppm was selected.*

This level, 61 ppm, is protective and conservative when compared to 120 ppm, which is the cancer risk of approximately one additional instance of cancer in 10,000 people (10^{-4}). This level is also consistent with EPA regulation in the NCP that establishes a range of acceptable risk as 10^{-4} to 10^{-6}, or a range of one excess cancer in 10,000 cases to one excess cancer in 1,000,000 cases.

It is also expected to be below the Site-specific urban background. For the i-ROD, US Geological Survey data from Pueblo County and all counties bordering it were considered, and several locations were removed based on proximity or location in an urban/residential area. As noted above, a BTV of 12.7 ppm of arsenic was developed from this data set, which included 10 samples which ranged from 0.7 ppm to 15.3 ppm. A BTV for Pueblo County was not established since only 5 sample locations were collected within Pueblo County, which is insufficient to develop a reliable BTV, but the concentrations for Pueblo County ranged from 1.7 to 15.3 ppm.

Although background arsenic levels of 9 ppm and 11 ppm were noted by the commenter, the EPA is only aware of the average State of Colorado background of 11 ppm. Background levels are not intended for use as cleanup action levels.

2.2 Technical Comments Received from Another Pueblo Community Member

Extensive comments were received from one community member during the 60-day comment period, which was open from July 14, 2017 through September 15, 2017. Due to the similarity of the comments, and to reduce repetitiveness in the Responsiveness Summary, a Crosswalk (below) is included to show the comment numbers and overlapping concerns. The comments were copied and pasted as received; however, formatted to align with EPA's requirements. Please note that several of the commenter's cited attachments were not included with the submittal. For completeness, EPA's responses are to the 48 comments received on September 15, 2017.

Technical Comments Crosswalk

September 15, 2017 Comment	August 14, 2017 Comment
1	4
2 (1st one, page 1)	2 and 2a
2 (2nd one, page 3)	NA
3	NA
4	NA
5	NA
6 (1st one, page 6)	2a
6 (2nd one, page 5)	8
7	2

7a	2a
8	4
9	5
10	6
11	7
12	related to 8 and 9
13	related to 8 and 9
14	9a
15	4 and also 9a
16	10
17	11
18	12
19	13
20	13
21	13
22	NA
23	14
24	15
25	15 (the second 15)
26	16
27	16
28	unnumbered
29	17
30	NA
31	18
32	NA
33	18
34	19 (labeled as 1)
35	20
36	21
37	NA
38	22
39	23
40	NA
41	NA
42	NA
43	NA
44	23
45	24
46	25
47	25
48	25

NA = no corresponding comment received

COMMENT 1

My primary comment for the entire project is the lack of documented planning using the Data Quality Objectives (DQO) (Planning) guidance. For example, the initial QAPP for the Demonstrations of Methods Study states in the following figure, taken from the report: DQOs are "not applicable" (this is shown in box 4 of the figure), copied from the report). This comment is discussed further in Comment 8.

EPA Response: *The Demonstration of Methods Applicability (DMA) sampling design is outside the scope and detail of the Proposed Plan. However, the Data Quality Objective (DQO) systematic planning process was followed for both the DMA and the Remedial Investigation (RI) sampling efforts.*

The example referred to in the comment seems to be confusion caused by a note in a text block on Figure 1, which states "Conduct systematic planning (Attachments B and C – Not applicable to this DMA)."

This note was not intended to imply that systematic planning is not applicable to the DMA, rather it was intended to communicate that Attachments B and C are not applicable. Page 8 of 100 in the DMA QAPP explains that "Figure 1 is a summary flowchart that outlines this DMA process. ***Where applicable****, the figure is supported by a series of attachments that provide additional detail on the project activities to be performed at key milestones of the project." (bold added for emphasis). Not applicable in the text box indicates that the DQO process is not documented in Attachments B and C, nothing more.*

As indicated on page 13 of the DMA QAPP, Attachment B, when applicable, would contain the systematic planning meeting agenda, and Attachment C would contain the CSM (conceptual site model) and data gap assessments conducted during systematic planning. Attachment B, the agenda(s) for the systematic planning meetings held on February 27, 2015 and March 24, 2015 (documented in the DMA UFP-QAPP, Worksheet #2, #9a and #9b) was listed as not applicable because a formal agenda was not prepared in advance of these meetings. Attachment C was listed as not applicable on Figure 1 because the CSM is provided on DMA QAPP Worksheet #10, instead of as a standalone attachment to the document. We apologize for the confusion. The EPA agrees with the commenter that "just collecting data to see what it tells us" is an unacceptable approach.

Early in the project, the EPA received comments from this commenter suggesting that the DMA QAPP and the DMA report did not appear to follow the DQO process. In response to these comments, the EPA provided the commenter with detail regarding where the information called for in each of the 7 steps of the DQO process is included in the DMA QAPP.

To prevent a reoccurrence of the issue, the EPA inserted additional text into the RI QAPP to clearly identify each step of the DQO systematic planning process. Each step in the DQO process is explicitly called out in the RI QAPP, starting on page 51. Bold formatting as included in the original document is reproduced below for clarity.

> *"****The problem to be addressed by the project (note that this corresponds to traditional DQO process question 1, "State the problem"):*** *The problem to be addressed by the project is to determine the nature and extent of metals contamination associated with the Colorado Smelter in the neighborhoods surrounding it." (RI QAPP revision 3, page 51)*
>
> ***"What will the data be used for (note that this also corresponds to traditional DQO process question 2, "Identify the goal of the study")?*** *Data generated from the RI will help the EPA to determine the nature and extent of smelter related contamination at the Site. Surficial soil and indoor dust sampling methodologies that ensure that data will be of a sufficient quality for decision making will be utilized. These data will support the EPA in conducting a HHRA. Data generated from the RI will be used to determine the COPCs that will be used to characterize the Site and PRGs that will guide cleanup decisions." (RI QAPP revision 3, page 54)*

"What type of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques; note that this corresponds to traditional DQO process step 3 and 5, "Identify the information inputs" and "Develop the analytical approach")? *Data for metals in soil and indoor dust from residential properties are needed to assess risk potentially associated with the Colorado Smelter Site.*

Data will consist of XRF analytical results and ICP-MS results. XRF will be used to analyze for target analytes (Pb/As) and potentially for accessory analytes (Cu, Mn, and Zn) in surface and subsurface soil. Accessory analytes may be analyzed by XRF if results indicate that they routinely exceed screening levels and can reliably be analyzed by XRF. Data for all other metals will be obtained using a subset of samples analyzed by ICP-MS. ICP-MS analysis will be performed on 20% of all samples initially. If results indicate that a lower percentage of analysis by ICP-MS is acceptable, the percentage may be reduced to as low as 5%, provided that preliminary COPC determination and XRF to ICP correlations have been satisfactorily documented.

Based on the DMA findings, which indicated that XRF results could be adjusted to be comparable to ICP-MS results, adjustments will continue to be made as was done during the DMA. This may be done on an instrument-specific basis if results indicate this is necessary (see Worksheet #37 for additional discussion of adjustments to XRF data).

ICP-MS will be used to analyze for all TAL metals in surface, soil, subsurface soil, and indoor dust (via EPA Methods 7471B and 6020B as defined by CLP SOW ISM 02.4). Analyses will be conducted by laboratories certified in the methods of concern. Raw data information should be retained in the project file in case a need for its use arises. In particular, all analytical quality control checks should be retained.

Sampling will be performed at a DU using either a 5-point systematic random composite or a 30-increment systematic grid approach. Most DUs will be sampled using the 5-point systematic random composite approach, but larger DUs (those 5,000 square feet or larger) will be sampled using the 30-increment systematic grid approach. During the DMA, it was shown that both approaches provided acceptable decision error rates for making decisions for DUs.

Soil samples will be archived at the Pueblo field laboratory or other appropriate secure storage location after XRF analysis and subsampling is complete.

In addition to soil data from residential properties, background data for soil will be collected during a background study (discussed in greater detail in a separate Background Study QAPP), which will help the EPA to determine the nature and extent of smelter-related contamination at the Site for the RI, and support the EPA in conducting a HHRA and ERA. If Site related contamination is found to be present in OU1 soils or indoor dust at levels which pose an unacceptable risk to human health and the environment, as established by project health based benchmarks, then further action may be required. This action could include additional confirmatory sampling, and/or mitigation or remediation of contaminated soils or dust." (RI QAPP revision 3, page 54-55)

"What are the boundaries of the study (this corresponds to traditional DQO process step 4, "Define the boundaries of the study")? *The study area consists of approximately 1,900 homes, three city-owned parks, one county-owned park, two school properties, and other properties located within the preliminary study area, a 0.5-mile radius of the former smelter (Figure 7, Worksheet #17). Runyon Field Park, a county-owned park, has been added as the fourth park at the request of the County of Pueblo to be included in the park sampling. The 0.5-mile radius is a preliminary study area based on the distance between the Colorado Smelter and the edges of the neighborhoods to the west, north, east, south, and southeast. The 1/2-mile study area surrounding the main stack of the Colorado Smelter was based on the observation that "Major smelter deposits exist primarily within a 0.5 km radius of the stack, although some studies have found elevated soil-Pb concentrations as* *far away as 30 km" and drop to 200 mg/kg and below by distances of approximately 3-5 km (EPA, 2006b). Soil lead concentrations decrease dramatically with distance from the source, and depend greatly on wind speed and wind direction (EPA, 2006b). Boundaries will be adjusted based on establishing site specific clean up levels from the HHRA and the results of the background study which will help to define natural and anthropogenic levels of metals in soils in the region. If metals concentrations near the perimeter of the study area are below health based bench marks, then the study area will not need to be increased. However, if metals concentrations near the perimeter of the study area are above health based bench marks, then additional data from the background study and geospeciation analysis will be considered to determine whether the study area should be increased. Surface and subsurface soil and indoor dust are the matrices of concern within this project boundary. Each of these matrices is detailed separately below for the remainder of the PQOs.*

***Matrix**: surface and subsurface soil." (RI QAPP revision 3, page 55)*

***"How "good" do the data need to be in order to support the environmental decision (note that this corresponds to traditional DQO process question 6, "Specify the performance or acceptance criteria")?** Data results will be calculated to be expressed as parts per million (ppm or milligrams per kilogram [mg/kg]) that can be confidently compared to a soil RSL (or Site-specific PRG) in units of ppm or mg/kg (at HQ=0.1) in the risk assessment. Soil data need to include measures of sampling and analytical variability (i.e., definitive data). Overall statistical variability in the data needs to be small enough so that decision error rates are below 5% for false negatives and 20% for false positives. Detection limits need to be low enough to statistically compare on-site with background concentrations. See Worksheets # 12, 15 and 37." (RI QAPP revision 3, page 55)*

How much data are needed (number of samples for each analytical group, matrix, and concentration; note that this question and the following four questions all correspond to traditional DQO process question 7, "Develop a plan for obtaining data)")?

Based on the expected number of DUs and depth intervals for the RI effort, approximately 30,000 residential soil samples are estimated for collection. This estimate is based on 1,200 properties, 6 DUs at each property, 4 depths at each DU, and triplicate samples collected at all four depths for 1 of every 20 DUs. Each of these samples will be analyzed via XRF while a subset (initially approximately 20%) will also be analyzed by CLP using method 6020B. Any changes in the frequency of samples analyzed via Method 6020B will be discussed with project stakeholders prior to implementation and will be documented in the RI report.

Unpaved alleys and unpaved streets will be separated into DUs consisting of one block lengths, and sampled using one 5-point random start linear systematic composite sample per linear block. It is anticipated that approximately 340 samples will be collected from unpaved alleys and unpaved streets (based on 85 unpaved DUs and up to 4 depths for each DU).

Three city-owned parks, one county-owned park, and two school properties will each be divided into a minimum of five DUs and sampled using the 30-point incremental approach unless an area is identified for additional characterization, in which case either the 30-point incremental or the 5-point composite approach will be utilized, as appropriate. It is anticipated that approximately 100 incremental composite samples will be collected from the three city-owned parks, one county-owned park, and two school properties based on approximately five DUs with four sample depths for each DU.

Commercial properties will be divided into DUs and sampled using either 5-point or 30-point incremental approach depending on the size of the DUs selected. DUs greater than 5,000 ft^2 will be sampled using the incremental approach. Smaller DUs will be sampled using the 5-point composite approach. It is anticipated that approximately 180 samples will be collected from select commercial properties based on four sample depths for each DU.

Where, when, and how should the data be collected/generated? *Samples will be collected and prepared on site. See Attachment E, Worksheets 17 and 18.*

Who will collect and generate the data? *PWT and TtEMI.*

How will the data be reported? *Both XRF and ICP data will be reported electronically. Results for individual properties will be reported to residents in letter format.*

XRF sample results for each sample bag will include a mean concentration, a relative standard deviation, and an upper confidence limit on the mean (UCL). XRF raw data will be exported from the instrument as excel spreadsheets, processed in a spreadsheet program, and imported into Scribe (access database) in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a).

The mean XRF concentration for each sample bag will be reported. When triplicates are collected, the mean for the three triplicates will be reported. The XRF field laboratory will provide electronic data deliverables (EDDs).

The CLP laboratory will provide electronic data deliverables (EDD) for Method 6020B ICP-MS data and Method 7471B CVAA data in accordance with the CLP contract.

How will the data be archived? *Data collected during the RI will be archived electronically using a Scribe database in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a). Hardcopies will be archived and managed by SEMS Document Management System R8 Records Center in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a).*

Matrix: *Indoor dust.*

How "good" do the data need to be in order to support the environmental decision*? Data results will be calculated to be expressed as parts per million (ppm or milligrams per kilogram [mg/kg]) that can be confidently compared to a soil RSL ppm or mg/kg (at HQ=0.1) in the risk assessment. Indoor dust data need to have provided with it measures of its sampling and analytical variability (i.e., definitive data). Overall statistical variability in the data needs to be small enough that the chance of decision error is acceptable to the risk manager. Acceptable decision error rates have been set at 5% for false negatives and 20% for false positives. Detection limits need to be low enough to statistically compare concentrations with risk-based screening levels. See Worksheets 12, 15 and 37.*

How much data are needed (number of samples for each analytical group, matrix, and concentration)?

Based on the expected number of homes and rooms per home to be sampled for indoor dust during the RI effort, up to 7,200 indoor dust samples are planned for collection. This estimate is based on 1,200 homes, 5 rooms per home, and one replicate sample per 20 homes. No dust samples will be analyzed via XRF, all dust samples will be analyzed by CLP using method 6020B. After 100 homes have been sampled and validated data received, dust data will be evaluated for hot spots and to see if there is any correlation between the levels observed in the home compared to the levels in surface soil collected at the home (0-1" and 1-6").

Where, when, and how should the data be collected/generated? *Samples will be collected and shipped to the offsite laboratory**.** See Attachment E, and Worksheets 17 and 18.*

Who will collect and generate the data? *PWT and TtEMI*

How will the data be reported? *The CLP laboratory will provide EDDs for Method 6020B ICP-MS data and Method 7471B CVAA data in accordance with the CLP contract. Results for individual properties will be reported to property owners and to residents in letter format.*

> ***How will the data be archived?*** *Data collected during the RI will be archived electronically using a Scribe database in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016). Hardcopies will be archived and managed by SEMS Document Management System R8 Records Center in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a). (RI QAPP Revision 3, page 55-57).*

COMMENT 2

REQUEST: This comment is a request for additional time to review the Interim Action proposal, as explained below in this comment:

1) EPA has not released their SAP for sampling indoor dust.
2) EPA has not released their revised QAPP for review by the public.
3) EPA's position on confidential addresses has not been documented.

It also appears that the proposed plan does not follow EPA Guidance: OSWER 9285.7-50 (Superfund Lead-Contaminated Residential Sites Handbook). Specifically the Handbook identifies limitations to EPA's authority to sample media indoors when Lead-Based paint is present and is a potential source of lead. Note that this is the case in the study boundaries of the investigation _see age of houses map.

However, since EPA has not released their SAP for indoor sampling, specific comments cannot currently be made. EPA's authority for performing indoor sampling in the presence of lead-based paint is critical for this project and requires evaluation.

REQUEST: Since the SAP for indoor dust is not available from EPA, I am requesting an extension to the comment period. That comment period would begin after EPA releases the interior dust SAP to the public for review. That review would ensure that an analysis of that OSWER directive for limitations identified in the recent Lead Handbook and CERCLA regulations from the Federal Register are reviewed and compared to the Sampling and analysis plan. This request for the SAP is to evaluate whether EPA is exceeding their authority under CERCLA to evaluate indoor contaminates when lead-based paint (LBP) is present. In general EPA has identified limitations for sampling home interiors.

In addition, one can see by my unfinished and poorly organized comments that insufficient time was allowed for commenting. Note that although EPA has had several months and staff to prepare the documents, EPA has not shared them in a timely manner (if at all) and then requests that the review time be limited.

Please note: I support EPA activities when EPA guidance is followed. EPA has performed many good things to protect public health and the environment. However, this Superfund project is a blatant misuse of authority and limited funds, based on a review of EPA guidance and CERCLA authority. However, EPA does have such authority under the Toxic Substances Control Act (TSCA). The TSCA guidance is quite different than CERCLA guidance, including acceptable lead concentrations in residential yards (note that for children play areas the level is 400 ppm lead in soil for TSCA, which is similar to CERCLS' lower range soil lead screening level (400 to 800 ppm).

EPA Response: *Information regarding TSCA and CERCLA guidance is noted. EPA Region 8 is not addressing lead-based paint or other indoor sources of lead at the Colorado Smelter Superfund Site. EPA Region 8 is investigating lead and arsenic in indoor dust, the source of which is residential soils impacted by air emissions from the former ASARCO smelter. Indoor dust sampling conducted by the EPA is planned and described in the Remedial Investigation Quality Assurance Project Plan (QAPP), as quoted above in the response to Comment 1. In general, QAPP's have replaced Sampling Analysis Plans (SAPs) as the tool used for planning EPA sampling. The most up to date RI QAPP, revision 3, is available online at https://semspub.epa.gov/work/08/1884190.pdf*

A single 30-day extension to the comment period has been granted. The EPA has decided not to extend the comment period further at this time.

Addresses and other personally identifiable information collected in the course of this site investigation have been deemed confidential and are not being publicly shared.

COMMENT 2

The study boundaries established for this investigation appear not to follow the available site-specific data of site-specific and available data, but instead focuses on areas with older homes that essentially guarantees the presence of soil lead from Lead-Based Paint (LBP). Note, as stated above, that EPA has limited authority to investigate LBP related hazards under CERCLA.

Quote from May 10 SAP: p. 11

"STEP 4 - DEFINE THE STUDY BOUNDARIES

The study area consists of neighborhoods located within 1-mile of the site and surface waters within 15 miles downstream of the Probable Point of Entry (PPE) of the site. Within the 1-mile radius <u>the study area primarily includes residences to the southeast of the [smelter] site in the direction of prevailing winds.</u> Background soil will be collected from an area not likely to be impacted by the smelters that historically operated in Pueblo".

However, the study boundaries are shown in the following figure. EPA extend the site investigation boundaries significantly to the west and southwest, which is **into** the direction of the prevailing winds. The study area does include exclusively (few exceptions –please view the map) homes built before LBP was banned. This means that a significant lead source to soil is LBP, and EPA has guaranteed finding soil lead by establishing these boundaries, but does not allow characterization of historic deposition of particles from the closed smelter.

Figure 2-1 Colorado Smelter Preliminary Study Area

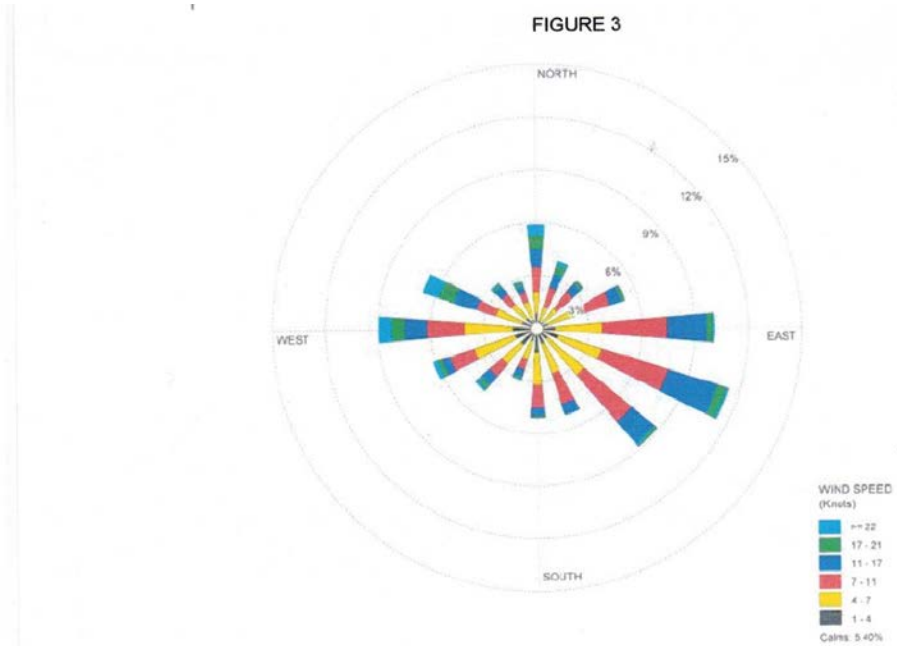


Figure 1. This is a composite of from the 2011 Analytical Results Report (Figure 3 - wind rows) and Figure 2-1 (The Study Area) from the 2008 Preliminary Assessment Report

Comparing the Study Area and the Wind rows figures, it is clear that the study boundaries were expanded to the west, which is dominated by older homes with LBP and is up wind (prevailing direction) of the actual smelter site.

<u>REQUEST</u>: Please provide documentation that supports the established study boundaries, when the study area is upwind of the potential source. Note that this would be "new" information developed after the 2008 preliminary assessment Colorado Smelter Pueblo, Colorado CERCLIS #: CON000802700 was published.

<u>EPA Response</u>: *The technical rationale and decision making which supported the initial site boundary are beyond the scope and detail of this Proposed Plan. However, the EPA did not establish the boundary arbitrarily. As described in the RI QAPP:*

"The 1/2-mile study area surrounding the main stack of the Colorado Smelter was based on the observation that "Major smelter deposits exist primarily within a 0.5 km radius of the stack, although some studies have found elevated soil-Pb concentrations as far away as 30 km, and drop to 200 mg/kg and below by distances of approximately 3-5 km (EPA, 2006b). Soil lead concentrations decrease dramatically with distance from the source, and depend greatly on wind speed and wind direction (EPA, 2006b). Boundaries will be adjusted based on establishing site specific clean up levels from the HHRA and the results of the background study which will help to define natural and anthropogenic levels of metals in soils in the region. If metals concentrations near the perimeter of the study area are below health based bench marks, then the study area will not need to be increased. However, if metals concentrations near the perimeter of the study area are above health based bench marks, then additional data from the background study and geospeciation analysis will be considered to determine whether the study area should be increased."

Wind speed and wind direction are important parameters to consider when establishing a site boundary, so available wind rose data has been considered throughout the project. Reference 26 of the HRS listing package includes wind rose plots for the Pueblo Airport prepared by the Western Regional Climate Center for the periods from 1942 to 1969, 1970 to 1989, and 1990 to 2012. Additional wind rose plots from the Rocky Mountain Steel Mill for the time period from 2003 to 2005 and from 2008 to 2009 were also included as Reference 46 associated with the HRS listing package.

It is noteworthy that the predominant wind direction in the vicinity of the site has shifted dramatically in the last 75 years. As a result, homes in the West, Northwest, North, East and Southeast portions of the study area are all known to have been in the predominant downwind direction for some length of time. These changes in wind patterns, as well as the current climate conditions at the site were considered when establishing the site boundary. Because wind direction varies in all directions at times, it is impossible to rule out specific directions. Data collected may in the future be used to contract or expand the study area in certain directions as supported by the data.

COMMENT 3

The following quote from the CDPHE 2010 sampling plan and is the entire section on developing decision rules.

"STEP 5 - DEVELOPING DECISION RULES

In general sample results will be compared to background samples to determine if an observed release or observed contamination can be documented (generally defined at three times background for the purpose of demonstrating attribution to the site) as defined in the Hazard Ranking System (HRS). Contaminants not meeting this threshold may not be considered for scoring the site under the HRS. Additionally, sample results will be compared to Superfund Chemical Data Matrix (SCDM) benchmarks to establish Level 1 contamination as defined by the HRS and other appropriate benchmarks such as CDPHE's residential soil cleanup table value standards (CDPHE HMWMD 1997). Results from samples collected at residential properties will be shared with property owners and house occupants and if metals concentrations exceed applicable benchmarks, then CDPHE may recommend additional action."

Colorado Smelter Site Inspection Sampling and Analysis Plan May 24, 2010 to Superfund Chemical Data Matrix (SCDM) benchmarks to establish Level 1 contamination as defined by the HRS and other appropriate benchmarks such as CDPHE's residential soil cleanup table value standards (CDPHE HMWMD 1997).

<u>REQUEST</u>: Could EPA please supply a table of Level 1 contamination as defined by the HRS and other appropriate benchmarks such as CDPHE's residential soil cleanup table value (standards)? This would minimize confusion about the values that are actually used in the report.

<u>EPA Response</u>: *The comment refers to the 2010 CDPHE Sampling Plan. Sampling, decision-making, and project planning conducted by state and local agencies are not within the scope of the Proposed Plan, and are not topics the EPA can respond to.*

COMMENT 4

EPA please comment and or clarify the meaning of the above quotation in the document.

Results from samples collected at residential properties will be shared with property owners and house occupants and if metals concentrations exceed applicable benchmarks, then "<u>CDPHE may recommend additional action</u>."

<u>EPA Response</u>: *The comment refers to the 2010 CDPHE Sampling plan. Sampling, decision-making, and project planning conducted by state and local agencies are not within the scope of the Proposed Plan, and are not topics the EPA can respond to. It would not be appropriate for the EPA to attempt to clarify a statement in a document written by others.*

COMMENT 5

EPA please provide a copy of CDPHE's recommendations for additional action for CAG review, assuming any were made.

EPA Response: *The comment refers to specific communication between the CAG and the CDPHE. Sampling, decision-making, and project planning conducted by state and local agencies are not within the scope of the Proposed Plan, and are not topics the EPA can respond to.*

COMMENT 6

Please note that the "HOUSE DUST SAMPLING PLAN" has not been made available to the public for review.

REQUEST: I request that the Sampling and Analysis Plan (SAP) for sampling house dust be made available for review by the public. I have requested this document in the past from (Pueblo) CDPHE, since they performed the sampling. There reply was that EPA prepared the plan. Therefore, Pueblo CHPDE did not provide the document. This request is critical in the evaluation of whether EPA is collecting samples for which they do not have authorization under CERCLA.

REQUEST: I also request an additional extension of time for comments because the requested SAP is critical to determining whether EPA has the authority under CERCLA to collect the proposed indoor samples. Without the SAP, it is impossible to evaluate EPA's authority under CERCLA to do the sampling..

This comment and response request is made because a review of: OSWER 9285.7-50 (Superfund Lead-Contaminated Residential Sites Handbook), it appears that the proposed plan may not be following EPA Guidance regarding authority to sample. Specifically the Handbook identifies limitations to EPA's authority to sample media indoors when Lead-Based paint is a potential source of lead. Because EPA has not released their SAP for indoor dust sampling, I request an extension to the comment period to receive the Sap and provide meaningful detailed comments.

Please note: I support EPA activities when EPA guidance is followed. EPA has performed many good things to protect public health and the environment. However, the more I learn about this Superfund project, it appears to be a blatant misuse of authority and limited funds.

EPA Response: *Indoor dust sampling conducted by the EPA is planned and described in the Remedial Investigation Quality Assurance Project Plan (QAPP), the DQOs are quoted above in the response to Comment 1. In general, QAPP's have replaced Sampling Analysis Plans (SAPs) as the tool used for planning EPA sampling. The most up to date RI QAPP, revision 3, is available online at https://semspub.epa.gov/work/08/1884190.pdf*

A single 30-day extension to the comment period has been granted. The EPA has decided not to further extend the comment period.

COMMENT 6

EPA has not demonstrated a release to the environment from the Pueblo Smelter.

A comparison of soil lead and arsenic concentrations do not demonstrate a good relationship between these two metals identified in site soil (Attachments 1 and 2). The correlation coefficients for metals including lead and arsenic are given in the following table:

	ARR	Diawara Study	Correlation coefficient between soil lead and distance from the stack	Weighted Average Data
Lead/Arsenic Correlation Coefficient	0.93258 (for vacant lots and roadways)	0.7636482 (this is "Background"		0.499757
Lead/Cadmium Correlation Coefficient		0.0040351		
Slag Piles Lead Zinc	0.841820339			

Also, the averaged soil lead concentrations and distance from the smelter (stack) do not support the Smelter as a source of lead in soil. (This assumes that stack emissions and fugitive emissions were sources). Attachment 1 (Average residential soil lead concentration vs Distance from the primary stack at the refinery.) Attachment 2 which is the correlation between soil lead and arsenic concentrations in soil.

It appears that, the assumption that the smelter was the source of residential soil lead and arsenic is not supported by the data.

EPA Response: *The listing determination is outside the scope and detail of the Proposed Plan. However, the detailed technical and health based rationale for listing the Colorado Smelter Site on the National Priorities List (NPL) was presented in the Hazard Ranking System (HRS) listing package, which was provided for public comment. Source attribution, which appears to be the primary issue raised in this comment, is addressed on page 38.*

The lack of statistical correlation between lead and arsenic in specific samples is not evidence that the smelter is not at least partially a source of the lead and arsenic contamination at the Site. The Colorado Smelter has been inactive for more than 100 years, and lead and arsenic have different mobility in soil and have likely separated from each other vertically in the soil profile to some degree. Aside from the evidence provided in the HRS listing package, attribution is further supported by geospeciation samples (see EPA Technical Memorandum titled, Geospeciation Technical Memorandum) that have shown that the source of these metals is predominantly pyrometallurgical and from smelting activity. EPA Region 8 is not investigating lead-based paint at the Colorado Smelter Superfund Site. EPA Region 8 is investigating lead and arsenic in indoor dust, the source of which is residential soils impacted by air emissions from the former ASARCO smelter.

COMMENT 7

The homes in the defined investigation area are old and were constructed long before lead-based paint was banned. This is shown in Attachment 3, is a map of the age of homes in the area.

EPA Response: *Comment noted.*

COMMENT 7a

EPA may not have the authorization under CERCLA to investigate home interior potential contamination when the source is likely lead-based paint (LBP). This comment is based on OSWER 9285.7-50: Superfund Lead-Contaminated Residential Sites Handbook.

Please respond to this comment so I and the public can understand how/why EPA has this authority.

EPA Response: *EPA Region 8 is not investigating lead-based paint at the Colorado Smelter Superfund Site. EPA Region 8 is investigating lead and arsenic in indoor dust, the source of which is residential soils impacted by air emissions from the former ASARCO smelter.*

The Superfund Lead-Contaminated Residential Sites Handbook describes EPA's policy on addressing multimedia contamination at residential lead sites. The Handbook recognizes that several sources of lead-contamination, including soil, ground water, airborne particulates, lead plumbing, interior dust, and interior and exterior lead-based paint may be present at Superfund sites where children are at risk or have documented lead exposure. These lead sources may contribute to elevated blood lead levels and may need to be evaluated in determining risks and cleanup actions at residential lead sites. However, there are limitations on the Agency's statutory authority under CERCLA to abate some of these sources, *such as indoor lead-based paint and lead plumbing because CERCLA responses may be taken only to releases or threatened releases into the environment (CERCLA §104 (a)(3) and (4)).*

COMMENT 8

EPA has not followed EPA'S Data Quality Objectives Guidance in this project from the beginning. As other comments will confirm, EPA has not applied the DQO planning process in this project. The DQO guidance is critical in supporting decision-making at a site.

Attachment 4, which is Figure 1 of The DMA Quality Assurance Project Plan (QAPP) States that the DQO Process is "not applicable" to this project (my reproduction of that figure is poor and is given below.

The box referred to is the fourth from the top of the figure. I assume that means that EPA will simply collect data and "see what it tells them (?)".

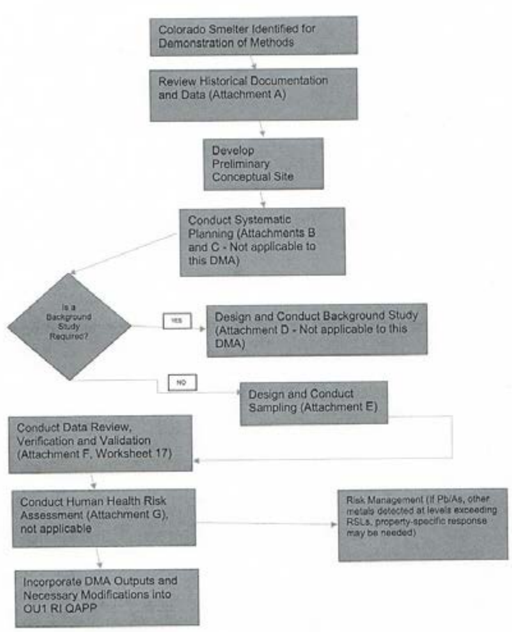
Please note that Table 5-3 of the Final DMA report has a heading "Clear Decision?, which is answered "yes" or "no".

However, the decision was not defined and the meaning of clear is also undefined. Please define what the decision is and the criteria (clear) for a yes or no decision as given in table 5-3.

<u>REQUEST</u>**: please provide documentation to support the position that the DQO planning is not required for EPA to collect samples for the DMA.**

It is my understanding that EPA guidance requires the DQO process to be performed any time samples are collected by EPA, EPA contractors, and subcontractors. I believe this is absolutely critical when the data are used to support decision-making.to support decision-making. If this is not correct, please provide quotes from EPA guidance to support the response.

Attachment 4:


Quality Assurance Project Plan for OU1 Demonstration of Methods Applicability
Colorado Smelter 08UA/OU1 DMA
Pueblo, Colorado

Revision Number: 2
Revision Date: 05/08/15

Figure 1: Decision Logic Diagram for the Colorado Smelter DMA Process

Document Control Number: WA136-RICO-08UA DMA

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Note that this was a popular approach (no DQO Planning) in the 1980's before the DQO process became guidance, but is not currently acceptable, unless EPA is exempt from following EPA guidance.

EPA Response: *The Demonstration of Methods Applicability (DMA) sampling design is outside the scope and detail of the Proposed Plan. However, the Data Quality Objective (DQO) systematic planning process was followed for both the DMA and the Remedial Investigation (RI) sampling efforts.*

The example referred to in the comment seems to be confusion caused by a note in a text block on Figure 1, which states "Conduct systematic planning (Attachments B and C – Not applicable to this DMA)."

This note was not intended to imply that systematic planning is not applicable to the DMA, rather it was intended to communicate that Attachments B and C are not applicable. Page 8 of 100 in the DMA QAPP explains that "Figure 1 is a summary flowchart that outlines this DMA process. ***Where applicable****, the figure is supported by a series of attachments that provide additional detail on the project activities to be performed at key milestones of the project." (bold added for emphasis). Not applicable in the text box indicates that the DQO process is not documented in Attachments B and C, nothing more.*

As indicated on page 13 of the DMA QAPP, Attachment B, when applicable, would contain the systematic planning meeting agenda, and Attachment C would contain the CSM (conceptual site model) and data gap assessments conducted during systematic planning. Attachment B, the agenda(s) for the systematic planning meetings held on February 27, 2015 and March 24, 2015 (documented in the DMA UFP-QAPP, Worksheet #2, #9a and #9b) was listed as not applicable because a formal agenda was not prepared in advance of these meetings. Attachment C was listed as not applicable on Figure 1 because the CSM is provided on DMA QAPP Worksheet #10, instead of as a standalone attachment to the document. We apologize for the confusion. The EPA agrees with the commenter that "just collecting data to see what it tells us" is an unacceptable approach.

Early in the project, the EPA received comments from this commenter suggesting that the DMA QAPP and the DMA report did not appear to follow the DQO process. In response to these comments, the EPA provided the commenter with detail regarding where the information called for in each of the 7 steps of the DQO process is included in the DMA QAPP.

In an attempt to prevent a reoccurrence of the issue, the EPA inserted additional text into the RI QAPP to clearly identify each step of the DQO systematic planning process. Each step in the DQO process is explicitly called out in the RI QAPP, starting on page 51. Bold formatting as included in the original document is reproduced below for clarity.

> *"**The problem to be addressed by the project (note that this corresponds to traditional DQO process question 1, "State the problem"):** The problem to be addressed by the project is to determine the nature and extent of metals contamination associated with the Colorado Smelter in the neighborhoods surrounding it." (RI QAPP revision 3, page 51)*
>
> ***"What will the data be used for (note that this also corresponds to traditional DQO process question 2, "Identify the goal of the study")?** Data generated from the RI will help the EPA to determine the nature and extent of smelter related contamination at the Site. Surficial soil and indoor dust sampling methodologies that ensure that data will be of a sufficient quality for decision making will be utilized. These data will support the EPA in conducting a HHRA. Data generated from the RI will be used to determine the COPCs that will be used to characterize the Site and PRGs that will guide cleanup decisions." (RI QAPP revision 3, page 54)*
>
> ***"What type of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques; note that this corresponds to traditional DQO process step 3 and 5, "Identify the information inputs" and "Develop the analytical approach")?** Data for metals in soil and indoor dust from residential properties are needed to assess risk potentially associated with the Colorado Smelter Site.*

Data will consist of XRF analytical results and ICP-MS results. XRF will be used to analyze for target analytes (Pb/As) and potentially for accessory analytes (Cu, Mn, and Zn) in surface and subsurface soil. Accessory analytes may be analyzed by XRF if results indicate that they routinely exceed screening levels and can reliably be analyzed by XRF. Data for all other metals will be obtained using a subset of samples analyzed by ICP-MS. ICP-MS analysis will be performed on 20% of all samples initially. If results indicate that a lower percentage of analysis by ICP-MS is acceptable, the percentage may be reduced to as low as 5%, provided that preliminary COPC determination and XRF to ICP correlations have been satisfactorily documented.

Based on the DMA findings, which indicated that XRF results could be adjusted to be comparable to ICP-MS results, adjustments will continue to be made as was done during the DMA. This may be done on an instrument-specific basis if results indicate this is necessary (see Worksheet #37 for additional discussion of adjustments to XRF data).

ICP-MS will be used to analyze for all TAL metals in surface, soil, subsurface soil, and indoor dust (via EPA Methods 7471B and 6020B as defined by CLP SOW ISM 02.4). Analyses will be conducted by laboratories certified in the methods of concern. Raw data information should be retained in the project file in case a need for its use arises. In particular, all analytical quality control checks should be retained.

Sampling will be performed at a DU using either a 5-point systematic random composite or a 30-increment systematic grid approach. Most DUs will be sampled using the 5-point systematic random composite approach, but larger DUs (those 5,000 square feet or larger) will be sampled using the 30-increment systematic grid approach. During the DMA, it was shown that both approaches provided acceptable decision error rates for making decisions for DUs.

Soil samples will be archived at the Pueblo field laboratory or other appropriate secure storage location after XRF analysis and subsampling is complete.

In addition to soil data from residential properties, background data for soil will be collected during a background study (discussed in greater detail in a separate Background Study QAPP), which will help the EPA to determine the nature and extent of smelter-related contamination at the Site for the RI, and support the EPA in conducting a HHRA and ERA. If Site related contamination is found to be present in OU1 soils or indoor dust at levels which pose an unacceptable risk to human health and the environment, as established by project health based benchmarks, then further action may be required. This action could include additional confirmatory sampling, and/or mitigation or remediation of contaminated soils or dust." (RI QAPP revision 3, page 54-55)

"What are the boundaries of the study (this corresponds to traditional DQO process step 4, "Define the boundaries of the study")? *The study area consists of approximately 1,900 homes, three city-owned parks, one county-owned park, two school properties, and other properties located within the preliminary study area, a 0.5-mile radius of the former smelter (Figure 7, Worksheet #17). Runyon Field Park, a county-owned park, has been added as the fourth park at the request of the County of Pueblo to be included in the park sampling. The 0.5-mile radius is a preliminary study area based on the distance between the Colorado Smelter and the edges of the neighborhoods to the west, north, east, south, and southeast. The 1/2-mile study area surrounding the main stack of the Colorado Smelter was based on the observation that "Major smelter deposits exist primarily within a 0.5 km radius of the stack, although some studies have found elevated soil-Pb concentrations as far away as 30 km" and drop to 200 mg/kg and below by distances of approximately 3-5 km (EPA, 2006b). Soil lead concentrations decrease dramatically with distance from the source, and depend greatly on wind speed and wind direction (EPA, 2006b). Boundaries will be adjusted based on establishing site specific clean up levels from the HHRA and the results of the background study which will help to define natural and anthropogenic levels of metals in soils in the region. If metals* *concentrations near the perimeter of the study area are below health based bench marks, then the study area will not need to be increased. However, if metals concentrations near the perimeter of the study area are above health based bench marks, then additional data from the background study and geospeciation analysis will be considered to determine whether the study area should be increased. Surface and subsurface soil and indoor dust are the matrices of concern within this project boundary. Each of these matrices is detailed separately below for the remainder of the PQOs.*

Matrix: surface and subsurface soil." (RI QAPP revision 3, page 55)

"How "good" do the data need to be in order to support the environmental decision (note that this corresponds to traditional DQO process question 6, "Specify the performance or acceptance criteria")? *Data results will be calculated to be expressed as parts per million (ppm or milligrams per kilogram [mg/kg]) that can be confidently compared to a soil RSL (or site-specific PRG) in units of ppm or mg/kg (at HQ=0.1) in the risk assessment. Soil data need to include measures of sampling and analytical variability (i.e., definitive data). Overall statistical variability in the data needs to be small enough so that decision error rates are below 5% for false negatives and 20% for false positives. Detection limits need to be low enough to statistically compare on-site with background concentrations. See Worksheets # 12, 15 and 37." (RI QAPP revision 3, page 55)*

How much data are needed (number of samples for each analytical group, matrix, and concentration; note that this question and the following four questions all correspond to traditional DQO process question 7, "Develop a plan for obtaining data)")?

Based on the expected number of DUs and depth intervals for the RI effort, approximately 30,000 residential soil samples are estimated for collection. This estimate is based on 1,200 properties, 6 DUs at each property, 4 depths at each DU, and triplicate samples collected at all four depths for 1 of every 20 DUs. Each of these samples will be analyzed via XRF while a subset (initially approximately 20%) will also be analyzed by CLP using method 6020B. Any changes in the frequency of samples analyzed via Method 6020B will be discussed with project stakeholders prior to implementation and will be documented in the RI report.

Unpaved alleys and unpaved streets will be separated into DUs consisting of one block lengths, and sampled using one 5-point random start linear systematic composite sample per linear block. It is anticipated that approximately 340 samples will be collected from unpaved alleys and unpaved streets (based on 85 unpaved DUs and up to 4 depths for each DU).

Three city-owned parks, one county-owned park, and two school properties will each be divided into a minimum of five DUs and sampled using the 30-point incremental approach unless an area is identified for additional characterization, in which case either the 30-point incremental or the 5-point composite approach will be utilized, as appropriate. It is anticipated that approximately 100 incremental composite samples will be collected from the three city-owned parks, one county-owned park, and two school properties based on approximately five DUs with four sample depths for each DU.

Commercial properties will be divided into DUs and sampled using either 5-point or 30-point incremental approach depending on the size of the DUs selected. DUs greater than 5,000 ft^2 will be sampled using the incremental approach. Smaller DUs will be sampled using the 5-point composite approach. It is anticipated that approximately 180 samples will be collected from select commercial properties based on four sample depths for each DU.

Where, when, and how should the data be collected/generated? *Samples will be collected and prepared on site. See Attachment E, Worksheets 17 and 18.*

Who will collect and generate the data? *PWT and TtEMI,*

How will the data be reported? *Both XRF and ICP data will be reported electronically. Results for individual properties will be reported to residents in letter format.*

XRF sample results for each sample bag will include a mean concentration, a relative standard deviation, and an upper confidence limit on the mean (UCL). XRF raw data will be exported from the instrument as excel spreadsheets, processed in a spreadsheet program, and imported into Scribe (access database) in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a).

The mean XRF concentration for each sample bag will be reported. When triplicates are collected, the mean for the three triplicates will be reported. The XRF field laboratory will provide electronic data deliverables (EDDs).

The CLP laboratory will provide electronic data deliverables (EDD) for Method 6020B ICP-MS data and Method 7471B CVAA data in accordance with the CLP contract.

How will the data be archived? *Data collected during the RI will be archived electronically using a Scribe database in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a). Hardcopies will be archived and managed by SEMS Document Management System R8 Records Center in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a).*

Matrix: *Indoor dust.*

How "good" do the data need to be in order to support the environmental decision*? Data results will be calculated to be expressed as parts per million (ppm or milligrams per kilogram [mg/kg]) that can be confidently compared to a soil RSL ppm or mg/kg (at HQ=0.1) in the risk assessment. Indoor dust data need to have provided with it measures of its sampling and analytical variability (i.e., definitive data). Overall statistical variability in the data needs to be small enough that the chance of decision error is acceptable to the risk manager. Acceptable decision error rates have been set at 5% for false negatives and 20% for false positives. Detection limits need to be low enough to statistically compare concentrations with risk-based screening levels. See Worksheets 12, 15 and 37.*

How much data are needed (number of samples for each analytical group, matrix, and concentration)?

Based on the expected number of homes and rooms per home to be sampled for indoor dust during the RI effort, up to 7,200 indoor dust samples are planned for collection. This estimate is based on 1,200 homes, 5 rooms per home, and one replicate sample per 20 homes. No dust samples will be analyzed via XRF, all dust samples will be analyzed by CLP using method 6020B. After 100 homes have been sampled and validated data received, dust data will be evaluated for hot spots and to see if there is any correlation between the levels observed in the home compared to the levels in surface soil collected at the home (0-1" and 1-6").

Where, when, and how should the data be collected/generated? *Samples will be collected and shipped to the offsite laboratory**.** See Attachment E, and Worksheets 17 and 18.*

Who will collect and generate the data? *PWT and TtEMI*

How will the data be reported? *The CLP laboratory will provide EDDs for Method 6020B ICP-MS data and Method 7471B CVAA data in accordance with the CLP contract. Results for individual properties will be reported to property owners and to residents in letter format.*

How will the data be archived? *Data collected during the RI will be archived electronically using a Scribe database in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016). Hardcopies will be archived and managed by SEMS Document Management*

System R8 Records Center in accordance with the U.S. EPA Region 8 Superfund Remedial Data Management Plan (EPA, 2016a) (RI QAPP Revision 3, page 55-57).

COMMENT 9

It appears the EPA may not be following guidance concerning sampling inside homes. For example, the Lead Handbook states:

a. P. 1 Lead contamination found inside homes may be caused by deteriorating lead-based paint (LBP), plumbing, or other sources <u>not resulting from a release into the environment</u>, and therefore may be more appropriately addressed by authorities and programs other than CERCLA

b. P 6. "Limitations on Response. The President (EPA) shall not provide for removal or remedial action under this section in response to a release or threat of release …from products which are part of the structure of, and result in exposure within, residential buildings or business or community structures." Note LBP is part of the original structure>

c. The proposed plan does not inform residents of the long term consequences of having their yard soil remediated. [EPA only stresses how "pretty" the yards will look after remediation and how "safe" they will be.] For example, remediated soil adjacent to structures as describe in Section 6.6.1 of the Handbook will have long-term consequences. <u>If the soil were already remediated</u>, EPA then has the authority to conduct response actions addressing soils contaminated by a release of lead-contaminated paint chips from the exterior of homes to prevent recontamination of soils that have been remediated. Residents beware! This project has long-term implications for you.

It is obvious that residential soil has not been remediated at the site. However, if EPA's proposed plan is approved, it will then have the authority to sample and "remediate" external LBP to prevent lead contamination of the remediated soil.

It appears obvious that EPA is only "guaranteeing" future work.

<u>EPA Response</u>:

a) EPA Region 8 is not addressing lead-based paint or other indoor sources of lead at the Colorado Smelter Superfund Site. EPA Region 8 is investigating lead and arsenic in indoor dust, the source of which is residential soils impacted by air emissions from the former ASARCO smelter.

b) EPA Region 8 is not responding to a release of hazardous substances from products which are part of residential structures at the Colorado Smelter Superfund Site. EPA is responding to lead and arsenic released by air emissions from the former ASARCO smelter and the environmental media impacted by those air emissions.

c) The preferred alternative described in the Proposed Plan for the early action interim remedy addresses residential soil and indoor dust contamination, as documented through the remedial investigation sampling. It is unknown at this time whether follow-on response actions may be necessary as a result of deteriorating exterior lead-based paint.

COMMENT 10

It is not clear that soil and in-hose dust remediation will reduce child BLLs?

EPA has performed expensive studies concerning the benefits of remediating yard soil and house dust.

Current EPA staff may not be aware of EPA's 1986 Study Tri City Study (Baltimore, Cincinnati, and Boston) which was to determine the effects of soil lead and house dust remediation on child BLLs however, that $10-15MM effort was substantial effort. Note that EPA did not approve of the researchers original conclusions, and the report went through several lengthy revisions to meet EPA's approval. The original conclusions (from an early draft) include:

A. Soil lead remediation: did not permanently reduce child BLLs,

B. interior dust levels were not permanently reduced, and the outdoor soil became re-contaminated within one year,

REQUEST: **I'm confident that EPA R8 can obtain all early draft versions and revisions of that particular study. When they do, they please provide electronic copies for the CAG, including excel spread sheet of the data to and provide an explanation why the conclusions were not correct.**

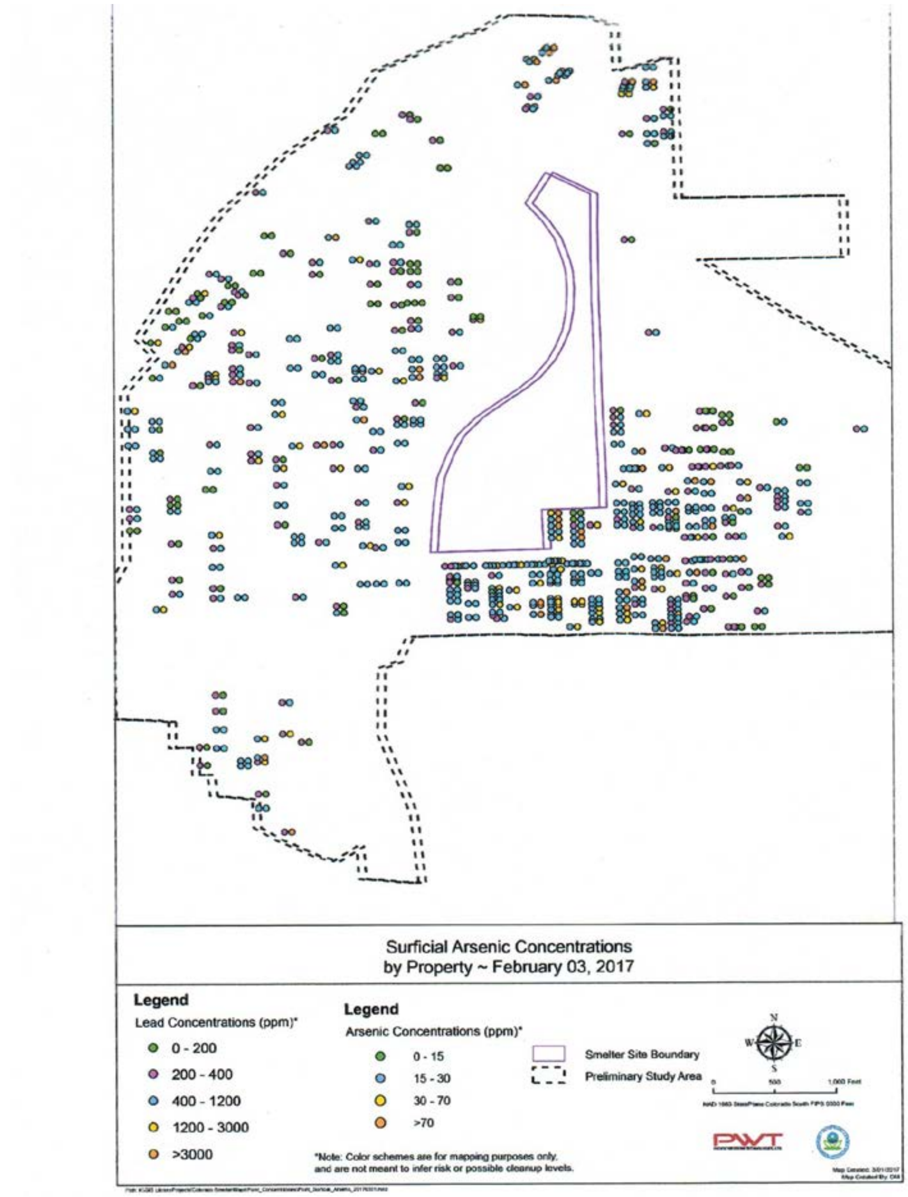
EPA Response: *Both draft and final versions of the 1986 Tri City Study mentioned are outside the scope and detail of the Proposed Plan and supporting documents. Further, it is not clear that a study conducted over 30 years ago in the Northeast, with specific data quality objectives unrelated to this project, and without consideration of the geology or land use history of the Pueblo area is relevant to the Proposed Plan at Colorado Smelter Site.*

COMMENT 11

The soil lead and arsenic concentrations are independent of each other.

As detailed below, the Colorado Smelter Superfund project has not included: "good science", nor followed EPA Guidance.

The DQO planning guidance was stated as "not applicable" in the initial report, and the interim results are based on assumptions that are not supported by the EPA-collected data. For example, it was assumed by EPA that lead and arsenic originated from a point source – the Colorado Smelter. If that were true, the soil lead and arsenic concentrations should decrease with distance from the source. EPA supplied two large illustrations for the CAG (Community Advisory Group) displaying the soil arsenic and lead concentrations in the investigations area. I combined the two maps so the relative lead and arsenic concentrations could be visually compared. This is shown below. When this figure is examined, it appears that the lead and arsenic concentrations are not related to each other and are not likely from a single source such as smelter stack emissions. EPA provided pdf copies of those documents. The copies were combined into one document so side-by-side visual comparisons could be made. That combined figure is shown below:



A review of the combined figure led to examining the correlation coefficients for all the metals with reported concentrations. The correlation coefficients are reported below:

Metal combination	Correlation Coefficient
Pb-Zn	0.6947482
Pb-AS	0.6451053
Pb-Cd	0.6017179
Cu-Pb	0.1951743
Pb-Co	0.157071
As Cu	0.1292745
Pb-Sb	0.0680621
Pb-Ni	0.0222166
Pb-Mn	0.002449

None of the correlation Coefficients are really strong (a +1 or a -1 is a perfect correlation). A perfect negative correlation coefficient is -1. A coefficient of 0 shows there is no relationship between the concentrations. None of the correlation coefficients (for all the metals) demonstrate a strong relationship between the metal concentrations.

Note that the correlation coefficient for lead and arsenic from the early Diawara study (which covered four transects from “out in the country” (where homes are relatively new and do not have -LBP, to the smelter area) is 0.7636482, while this is a better correlation, and is close to the on-Site value given above, it supports an earlier Wilcocon Rank Sum analysis, which was submitted to EPA that compared on-site and off-site soil arsenic concentrations, Results of that analysis are provided below. That analysis, which followed EPA guidance for comparing site and background data showed the background arsenic was no different than the initial site investigation arsenic concentrations taken from the ARR.

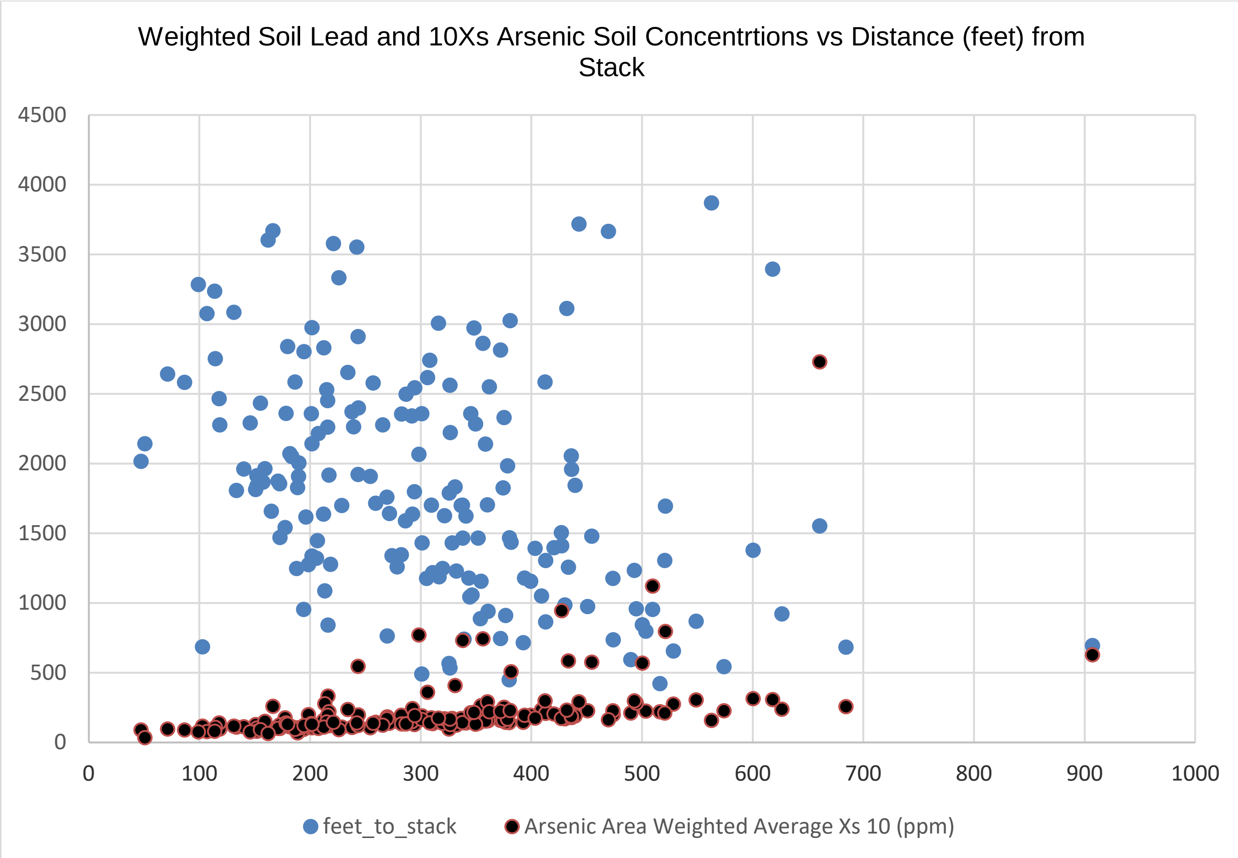
It is concluded that the lead-arsenic correlation coefficients for the Site and background are very similar. These analyses show that the Pueblo Smelter did not contribute significant amounts of these lead or arsenic to nearby soil.

Note that other correlations between other metals for the Diawara report could not be made because other metal concentrations were not were not reported.

Note that the other concentrations could be obtained from Diawara since the mass spectrometer analysis used quantifies all metals. EPA should “encourage” by paying, Diawara to compile and release those data.

The correlation coefficient for Lead and Arsenic for the Diawara data is 0.7636482, which is close to that identified at the site (above in comment 6 (0.6451053)). The correlation coefficient for Daiwara’s lead and cadmium is 0.0040351, which is much lower than on the Site (0,6017179). The greater correlation for Pb/Cd for the Site may be indicative of an unidentified source of Cd in the study area.

EPA supplied distances from the primary stack, and weighted average lead and arsenic concentrations for each yard. When those data are plotted (weighted average soil lead and arsenic) versus distance from the stack, The following plot is obtained:



The above plot documents that the soil lead concentrations are not dependent on distance from the smelter and that the weighted average soil arsenic concentrations actually increases with distance from the smelter.

It is concluded that particulate arsenic from the smelter stack is not source of arsenic to the investigative area soil.

REQUEST: **I request that EPA respond to all issues identified in comment 11.**

EPA Response: *Although the Colorado Smelter has been shown to contribute to elevated lead and arsenic concentrations in soils in OU1, the smelter is not the only source of these metals, or other metals in soil within the OU. Several other sources contribute, including natural background, deposition from other wind-blown material, as well as the contribution of other man-made sources such as historic deposition of lead from automobile emissions (prior to the removal of lead in gasoline), deposition from other industrial sources, or lead paint. The presence of these other sources affects any correlations between one metal and another. In addition, the composition of specific ore treated at the smelter may also vary at times, meaning that the ratio of metals to one another is not expected to have been constant.*

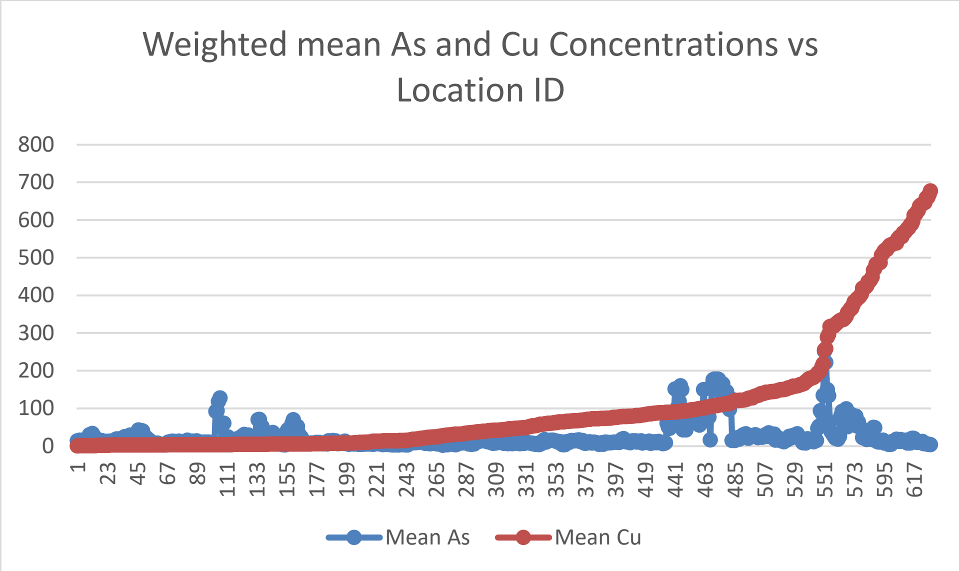
The commenter has not specified from what data set the specific correlation coefficients cited by the commenter were calculated, and EPA has not attempted to reproduce these coefficients in an effort to confirm or refute them. However, the commenter appears to be confusing the concept of a correlation coefficient with the concept of an elemental ratio. The elemental ratios are not constant over the study area, due in part to the factors noted above. This does not prove that there is not a significant contribution from the Colorado Smelter. As noted in the response to Comment 1, attribution was established in the HRS listing package and has been further substantiated by geospeciation studies (see EPA Technical Memorandum titled, Geospeciation Technical Memorandum) that show that the lead and arsenic in the soils are predominantly from pyrometallurgical sources associated with smelting activity.

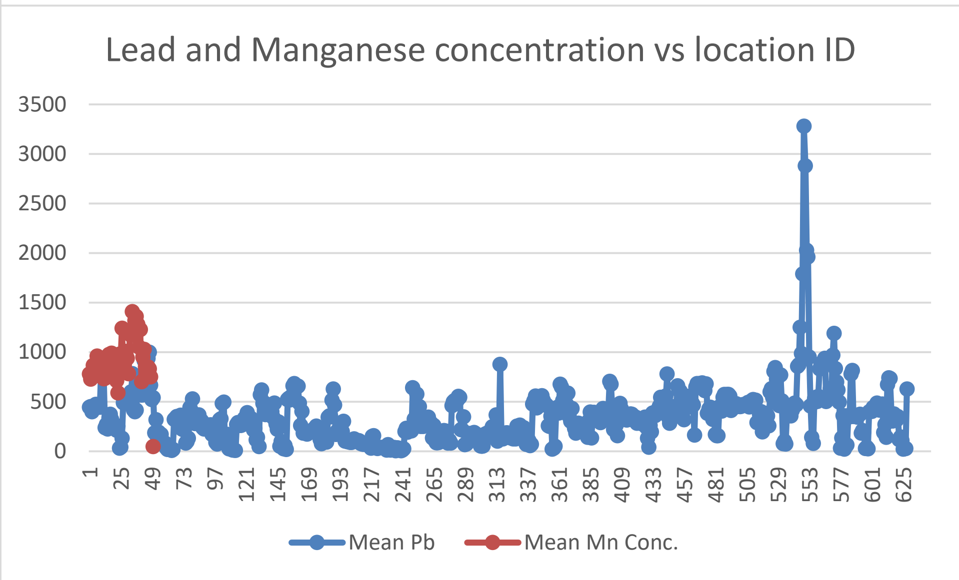
Although the commenter is correct that correlations between distance and concentration could be used to support attribution of the source of elevated concentrations, there are many confounding factors to this type of analysis, and would in any case require consideration of both distance and direction from the site, and predominant wind direction over time, at a minimum. More importantly, attribution of the elevated concentrations observed to the Colorado Smelter Site was part of the HRS listing package, and is beyond the scope of the Proposed Plan.

COMMENT 12

EPA should plot the locations of Cu and Mn concentrations to identify the potential contributions to soil. This is very difficult to do, since EPA has declared that addresses are confidential and cannot be shared with the public. Perhaps Longitude-Latitude information could be shared and then the data could be plotted over the area. Given sufficient time and effort, I should be able to furnish those plots if EPA chooses not to do so**.**

The following graphs show that copper concentrations increase with increasing property number and that manganese are increased at low property numbers.





<u>REQUEST</u>: Please evaluate all of the metals concentrations and plot them in order to identify potential sources of the metals other than assuming it was due to the historic smelter. In addition, EPA, please

supply latitude and longitude data for the sampled locations. This will keep the addresses "confidential" as you have declared is EPA guidance or policy and allow the public to evaluate the data.

EPA Response: *The commenter refers to property numbers, which EPA assumes to be the 6 character alphanumeric code assigned to each property. Unfortunately, the property codes were not assigned according to any strict geographical sequence or with any intent of facilitating this kind of geographical analysis. As a result, no conclusions can be drawn from plotting concentration versus property code as has been done on the figures above.*

Latitude and Longitude data for sampled locations have not been released to protect the privacy of individuals who have consented to sampling.

While not electing to perform the additional suggested analyses at this time, the EPA remains confident that the source attribution conducted during the listing stage of the project and supported by subsequent geospeciation analysis, as reported in EPA Technical Memorandum, "Geospeciation Technical Memorandum," is reliable.

COMMENT 13

When the concentrations of manganese and copper are plotted (vs Site number) it appears that an additional source is contributing them to the soil. This is shown in the following graphic.

INSERT figure

When the concentrations of lead and Manganese are plotted, it appears that the lower property numbers are impacted by an undefined manganese source, and the higher property numbers are impacted by an undefined copper source. Is it possible that the steel plant is making these contributions? **Please Respond**.

EPA Response**:** *EPA did not receive the figure noted above. The commenter refers to property numbers; which EPA assumes to be the 6-character alphanumeric code assigned to each property. Unfortunately, the property codes were not assigned according to any strict geographical sequence or with any intent of facilitating this kind of geographical analysis. As a result, no conclusions can be drawn from plotting concentration versus property code. The EPA remains confident that the source attribution conducted during the listing stage of the project and supported by subsequent geospeciation analysis (see EPA Technical Memorandum titled, Geospeciation Technical Memorandum) is reliable.*

COMMENT 14

EPA did not follow their own guidance when responding to my previous comment comparing background (Diawara paper) arsenic concentrations to early (DMA) site results.

History:

I performed a statistical test (the EPA-recommended test-Wilcoxon Rank Sum) to compare background arsenic concentrations to the arsenic concentrations identified at the site (The site data was from the Analytical Results Report for the Demonstrations of Methods Study, and the background data was from the study by Diawara.

My comments to the local City Council and letters to the editor of the Pueblo Chieftain, resulted in an EPA administrator (David Ostrander, Acting Director Assessment & Revitalization Program) personally attacking my credibility – amazing! A copy of that letter is included as Attachment 5.

The letter states that they could not reproduce my result and stated that 5 different statistical test were performed to support their position. (NOTE, EPA cautions (in guidance for comparing site and background data and recommends ONE test, the Wilcoxon Rank Sum test, which I used.

The guidance also cautions about using other statistics for comparison of site and background concentrations be because there is a great chance for misinterpretation. EPA did not share their Wilcoxon rank sum results, they simply stated they could not reproduce my results. EPA did not provide the results of their Wilcoxon Rank sum analysis performed. I am requesting EPA to identify the 5 statistical tests and cite EPA guidance for their use in comparing site and background concentrations and to provide their results of the Wilcoxon Rank sum test. (I'm not a statistician and could certainly make mistakes. However, I assume EPA would specifically inform me of mistakes.

The important issue is that EPA did not follow their guidance to compare on-site and off-site chemical concentrations.

The EPA letter did not discuss, identify the 5 different tests, or include the results for the 5 five different statistical tests reportedly used by EPA's statistician. The actual product given to Pueblo City Council was simply graphical representations of the data which compared the means. Yes, the visual presentation and discussion was powerful and convincing for the uninformed educated lay person, but as stated in EPA guidance (for comparing site and background data), graphical methods and comparing averages, maximum values, etc. may result in serious decision errors: The guidance states:

"Section 5.2 Simple Comparison Methods

Simple comparison methods such as described in the response, rely on descriptive summary statistics, such as comparing means or maximums. These approaches can be used with very small data sets but are highly uncertain."

The EPA guidance recommends that comparisons of off-site and on-site concentrations using the (Wilcoxon Rank Sum) test (which I used). EPA stated only that their statistician could not reproduce my results. I did not request them to reproduce my results, only to follow the EPA guidance, as I did, to compare data populations (as recommended in EPA guidance.

Note that I did not provide EPA with an "active" spreadsheet that includes the many formulas for the calculations. I supplied a "picture" of the excel page input data and results and did not include formulas but included the input data used in the Wilcoxon Rank Sum analysis. EPA did not comment on the data I used. I did not submit the active spread sheet because I was concerned that one or more of the many formulas could potentially be "modified", and it would be a significant effort to identify potential formula changes. Note that this straight-forward statistical test can easily be duplicated by EPA, to confirm the conclusions, but instead they supplied various data plots for the Pueblo City Council and indicated that my results could not be duplicated. EPA did not provide the results of their statistical Wilcoxon analysis for review or comment. They simply stated they could not reproduce my results.

However, the plots were impressive to the average educated lay person, but as guidance suggests graphical approaches are potentially erroneous and the Wilcoxon Rank Sum test should be used to compare background and site related concentrations.

The EPA letter states that their statistician used five different statistical tests, (EPA guidance only identifies the Wilcoxon Rank sum test), but EPA only provided distribution curves to the Pueblo City Council.

REQUEST: Please have EPA identify and provide electronic copies of the 5 tests performed and the results in spread sheets that can be analyzed by the public. Also have EPA provide the actual results of the Wilcoxon test they performed (including the input data).

EPA Response**:** *The issue described is beyond the scope and detail of the Proposed Plan. Background for the Proposed Plan followed EPA guidance and can be found in the COPC memo, which is included as Appendix A in the Proposed Plan.*

COMMENT 15

EPA has specific guidance related to Project Planning. It is called the Data Quality Objectives (DQO) planning Process. Project Planning has not been performed or documented in this project, which is required according to EPA DQO guidance. In fact, the DMA report (Demonstration of Methods) states in Figure 2, shown below: that the DQO Process is not applicable.

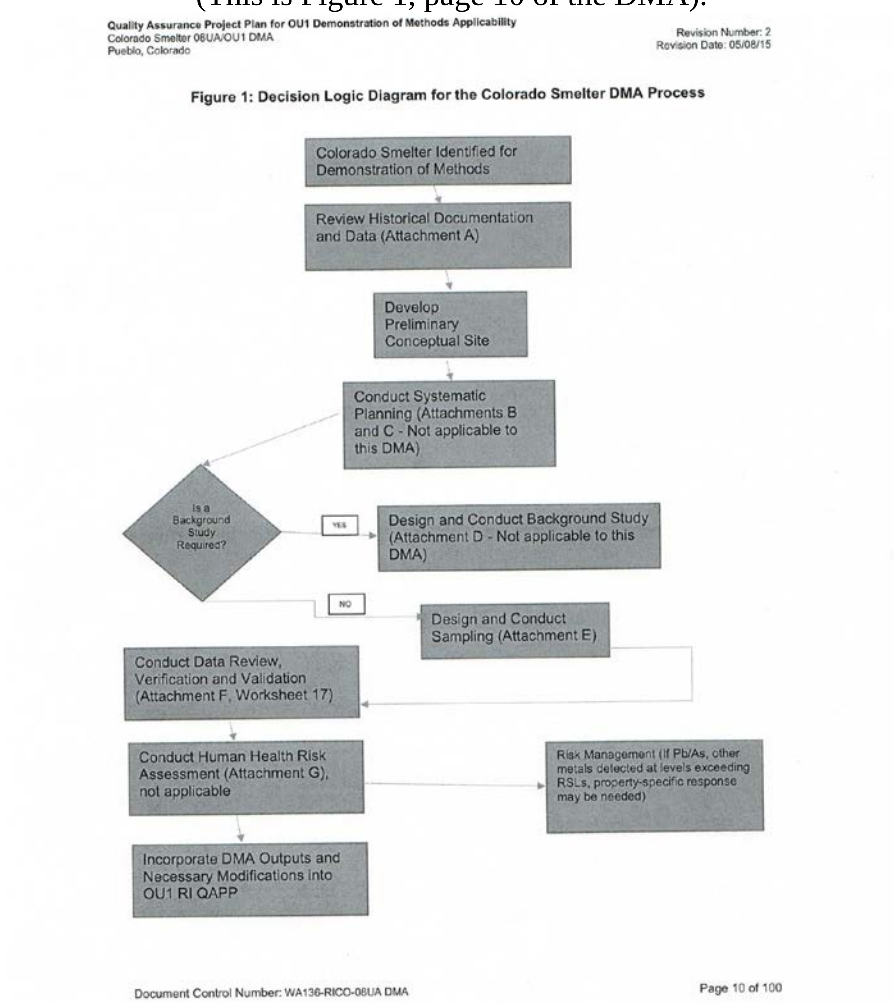
I assume that means "we will collect data and see what it tells us." That was clearly the approach used in site investigations before the DQO guidance was issued in 1987.

Note that Mr. Alvin Alm, then Deputy Administrator of the EPA, in his memorandum of May 24, 1984 to the Assistant Administrators, stated "that one of the most important steps in assuring the quality of environmental data is development of DQOs."

<u>REQUEST</u>: **Please identify all situations where the DQO process is not applicable to collecting samples at a Superfund Site Investigation. Note that EPA has also prepared the following guidance: 'Data Quality Objectives for Remedial Response Activities, March 1987, OSWER Directive 9335.0.003A.**

Figure 2

(This is Figure 1, page 10 of the DMA).



A simple critique is that the quantity and quality of data required to support decision-making was not identified, the actual decisions to be made were not defined, the acceptable uncertainty in the decision was not defined and the quantity and quality of data was not defined. When questioned about future data, EPA simply states that "more data are needed". I can supply many specific comments for consideration Mr. Pruitt's staff.

Note that these same comments apply to the most recently available Sampling Plans.

Before continuing, let me state that I support EPA guidance, but my experience is that EPA often does not follow their own guidance. That appears to be the case in this investigation.

EPA Response**:** *The Demonstration of Methods Applicability (DMA) sampling design is outside the scope and detail of the Proposed Plan. However, the Data Quality Objective (DQO) systematic planning process was followed for both the DMA and the Remedial Investigation (RI) sampling efforts. The issue referred to in the comment seems to be confusion caused by a note in a text block on Figure 1, which states "Conduct systematic planning (Attachments B and C – Not applicable to this DMA)."*
*This note was not intended to imply that systematic planning is not applicable to the DMA, rather it was intended to communicate that Attachments B and C are not applicable. Page 8 of 100 in the DMA QAPP explains that "Figure 1 is a summary flowchart that outlines this DMA process. **Where applicable**, the figure is supported by a series of attachments that provide additional detail on the project activities to be performed at key milestones of the project." (bold added for emphasis). Not applicable in the text box indicates that the DQO process is not documented in Attachments B and C, nothing more.*
As indicated on page 13 of the DMA QAPP, Attachment B, when applicable, would contain the systematic planning meeting agenda, and Attachment C would contain the CSM (conceptual site model) and data gap assessments conducted during systematic planning. Attachment B, the agenda(s) for the systematic planning meetings held on February 27, 2015 and March 24, 2015 (documented in the DMA UFP-QAPP, Worksheet #2, #9a and #9b) was listed as not applicable because a formal agenda was not prepared in advance of these meetings. Attachment C was listed as not applicable on Figure 1 because the CSM is provided on DMA QAPP Worksheet #10, instead of as a standalone attachment to the document. We apologize for the confusion. The EPA agrees with the commenter that "just collecting data to see what it tells us" is an unacceptable approach.

COMMENT 16

EPAs blood lead model (IEUBK (Integrated Exposure Uptake Biokinetic) model. The most recent guidance document for EPA's blood lead model (available to the public on the internet) is OSWER #9285.7-15-1 February 1994, and there have been several revisions to the program since then. I am attempting to determine whether it has been independently validated. It appears that is has and I am reading the verification material EPA provided by EPA R8. There were several "in house validations by EPA in the past. Model Validation is important since EPA does not consider Blood Level Measurements in their decision-making and rely only on the model results for decision-making. Note that EPA's goal for remediation regarding BLLs is that no more than 10% of the children will have BLLs greater than 10µg/dL. That goal has already been met for the Colorado Smelter Superfund Site.

Note that I published a peer-reviewed paper demonstrating that the IEUBK model did not identify children with high blood lead levels (BBL) at the Leadville _Superfund site. The percent of children with measured BLLs greater than 10 µg/dL. Note that the paper was peer reviewed, but only because of the potentially sensitive issues related to EPA's IEUBK model.

There have been several iterations of the model since my paper, but no recent EPA guidance has been published that is available to me.

The paper was peer reviewed. I am having difficulties obtaining a copy, but Charles Partridge, EPA R8 has access.

EPA Response**:** *The IEUBK has undergone rigorous scientific peer review (both external and internal). The National Academy of Science has also reviewed the model. A brief history of the validation process can be found at: https://clu-in.org/meetings/leadinurbansoils/slides/Tuesday_1400a-Partridge.PDF.*

COMMENT 17 - EPA's Conceptual Site Model and QAPP for the Colorado Superfund Site

I understand that the Conceptual Site Model (CSM) is often updated during the investigation, because of new information obtained. This has occurred in this project. However, the revised conceptual model provided to me was imbedded in a revised QAPP.

The revised QAPP has not been made available to the CAG or public. How can the public make comments in the 30-period when critical revised documents have not been made available?

Request: I am requesting an additional 30 extension to the comment period to review the revised QAPP. I assume it has information related to sampling indoor dust.

EPA Response: *As noted in the comment, the conceptual site model (CSM) for the Colorado Smelter Site is not a standalone document, but rather is included in the Remedial Investigation Quality Assurance Project Plan (RI QAPP). The revised CSM was provided directly to the commenter with the revised QAPP (as noted in the comment above), and the most up to date RI QAPP, revision 3, is also available online at https://semspub.epa.gov/work/08/1884190.pdf.*

A single 30-day extension to the comment period has been granted. The EPA has decided not to further extend the comment period.

COMMENT 18

I recommend that EPA Region 8 hire a high school chemistry teacher to support their staff when identifying detected chemicals and their symbols. The XRF Data released to the public identifies Thorium as a metal identified by XRF analysis. Probably due to the fact EPA staff apparently does not know chemical symbols. The symbol identified in the EPA spread sheet for all XRF data was Th. **Thorium** (not thallium the symbol Th is thorium, which is a metal and chemical element with radioactive properties. I assume the actual element was **Thallium (Symbol Tl),** which is a metallic element. With the symbol Tl, it has atomic number 81. I assume that the first draft was written and an uninformed person who assumed that Th was thallium.

Or perhaps EPA chose Thallium, which is a gray **very toxic metal** because Thallium and its compounds are toxic and should be handled carefully. Thallium occurs in the environment naturally in small amounts. It is not applied widely by humans, but has been used as rat poison and as a substance in electro-technical and chemical industries. These applications could result in human exposure to thallium compounds.

Thorium has the symbol Th. It is not clear why this element would be analyzed or reported.

REQUEST: Please review and explain why Thorium was analyzed and reported, it appears that this issue was simply wasting EPA's limited resources. Was this simply because thorium is a very toxic metal?

EPA Response: *EPA believes the table the commenter is referring to is Appendix D to the report "Demonstration of Methods Applicability at Colorado Smelter." This appendix provides the XRF data for all metals reported by the XRF. The assumption that the commenter makes is incorrect – the symbol "Th" reported by the XRF is, in fact, thorium. Thallium is not reported by the XRF in the method used for analysis of samples at the Colorado Smelter Site. The rationale for selection of analytes for the Demonstration of Methods Applicability is contained within that document.*

COMMENT 19

Why was this site listed? The way information was released by EPA and the Colorado Department of Health and Environment (CDPHE) resulted in concerned parents panicking about their children's health and demanding that some action be taken. Note that similar circumstances are present for the interim remedial action. The citizens are "demanding" that some action takes place by EPA. I assume that because the public knows that the project life time for Superfund sites in Colorado is 26 years (in 2014) and that only three sites have been completed or deleted. Therefore, a proposed interim action is made. EPA does not explain all of the follow-on studies and actions that must be performed related to an interim action and the presence of exterior LBP- they are substantial and will take significant amounts of time. The public needs to be informed.

REQUEST: EPA please describe for the public the follow-up activities that must occur if the proposed interim actions take place i.e.: exterior LBP testing, periodic soil testing for lead in the yard, etc. Does EPA request a complete list of required follow up actions? Please provide a time line for the required follow up activities, so the public can make informed decisions about the proposed interim action.

<u>EPA Response:</u> *The listing determination is outside the scope and detail of the Proposed Plan. However, the detailed technical and health based rationale for listing the Colorado Smelter Site on the National Priorities List (NPL) was presented in the Hazard Ranking System (HRS) listing package, which was provided for public comment.*

The preferred alternative described in the Proposed Plan for the early action interim remedy addresses residential soil contamination, as documented through the remedial investigation sampling. It is unknown at this time whether follow-on response actions may be necessary as a result of deteriorating exterior lead-based paint.

Please note that of the 23 Colorado Superfund sites on the NPL, 13 have achieved site-wide construction completion and three of the 13 have been deleted.

COMMENT 20

The CDPHE has stated in Public meetings and the Chieftain that children in the Eilers neighborhood have "reportable blood lead levels (BLLs). It was not explained in the Chieftain that, based on Colorado regulations, <u>**ALL**</u> BLLs are reportable and having a reportable level is not requirement for taking action to reduce BLLs. The way this information was released resulted in unnecessary concern/panic for mothers in the area that have small children. I assume the panic was intentional to promote listing the site. CDPHE has not been straightforward in reporting information about the grant they received from EPA to perform several studies in the area. Note that EPA R 8 used the same "fear tactics" to promote citizen support of a Superfund Site.

REQUEST. Based on available BLL data, it appears that the "remediated soil" BLL goal has been met – without soil remediation.

REQUEST: EPA please explain how soil remediation at this site would reduce the BLLs to values when the BLLs are within those that are "acceptable as defined for soil-remediated goals.

Please explain to the public that one of EPA's soil remediation goals is to reduce child BLLs so that no more than 10% of the children have BLLs greater that 10µgdL and that no more than 1 % have BLLs greater than 15 µg/dL and document the BLLs obtained for children in the study area.

<u>EPA Response</u>*: Blood lead testing is a voluntary project that is being conducted by the Pueblo City-County Health Department and is an ongoing process that will continue throughout the project. Therefore, it cannot be concluded that the blood lead level goals have been met or that they are acceptable at this time.*

COMMENT 21

EPA has not provided the SAP for sampling home interiors. I have requested that CDPHE provide the Sampling and Analysis Plan, which would include the Data Quality Objectives (DQO) planning document for their studies. The CDPHE response is that EPA prepared the plan and they are simply following it. This is critical since DQO planning identifies how the data will be used in decision-making, the decisions to be made, the decision rule, and the acceptable confidence in the decision.

REQUEST: I request that the EPA SAP for indoor dust (which should include a DQO planning section) and data collected to date be made available for public review. It would be helpful if EPA could include the weighted average yard soil lead concentrations and a description of the relationships between those data and house dust lead concentrations.

Note that review of that document will require additional time and I REQUEST an extension of the comment period.

<u>EPA Response:</u> *Indoor dust sampling, including documentation of the systematic planning process for indoor dust sample collection, is included in the RI QAPP, revision 3, which is available for public review online at https://semspub.epa.gov/work/08/1884190.pdf.*

EPA acknowledges the request for weighted average yard soil concentrations and further description of the relationship between indoor dust and yard soil to be added to the RI QAPP. However, the EPA is not electing to make this revision to the QAPP at this time.

The EPA has decided not to further extend the comment period.

COMMENT 22

It is also critical that EPA addresses EPA's Toxic Substances Control Act (TSCA) issues related to LBP investigations and EPA's limitations in characterizing indoor dust when the lead is from LBP.

REQUEST:

Please identify the rational used to eliminate TSCA guidance from consideration. I assume, based on an analysis of the available EPA data and the study boundaries, which include areas up wind of the Smelter, that the soil lead source is LBP. LBP is not regulated under CERCLA, but is regulated under TSCA.

<u>EPA Response:</u> *EPA Region 8 is not addressing lead-based paint or other indoor sources of lead at the Colorado Smelter Superfund Site. EPA Region 8 is investigating lead and arsenic in indoor dust, the source of which is residential soils impacted by air emissions from the former ASARCO smelter.*

COMMENT 23 – SOIL TYPE

At CAG meetings, I have inquired about the soil types identified in the investigation. It was stated that soil type was not a subject in the investigation.

However, note that P 100 of 100 of the final DMA states;

"Sufficient properties should be selected for field replication so that there is confidence that either

1) all DUs for all properties have similar soil heterogeneity, or
2) soil heterogeneity varies with depth and/or by the property's <u>soil type</u>."

REQUEST:

Please document the rationale for not determining soil type.

Please explain using EPA Superfund Guidance, why soil type is not identified and reported in the RRR (remedial).

Based on the final DMA, it appears that soil type is important and should have been identified for yard soil, since various metals migrate differently in different soil types. And different soil types have (naturally) a range of arsenic concentrations.

DMA QAPP WORKSHEET #17 Sampling Design and Rationale states:

The Soil Type data is not reported, even though P 100 of 100 of the final DMA Report states:

"Sufficient properties should be selected for field replication so that there is confidence that either 1) all DUs for all properties have similar soil heterogeneity, or 2) soil heterogeneity varies with depth and/or by the properties soil type."

REQUEST: EPA please provide guidance references stating that soil type is not necessary in a Super Fund Investigation.

EPA Response**:** *The statement from the DMA QAPP, quoted twice in the comment above, was included in that document to ensure that soil heterogeneity, not specific soil type, was evaluated for the yards in the study area to determine whether the sampling designs the DMA demonstrated were adequate (a single 5-point composite in most decision units, with 5% triplicate frequency, and 30 point incremental samples collected only when DU size exceeded 5,000 sf) would in fact be sufficient to characterize soil concentrations throughout the study area.*

"Sufficient properties should be selected for field replication so that there is confidence that either 1) all DUs for all properties have similar soil heterogeneity, or 2) soil heterogeneity varies with depth and/or by the property's soil type. Field heterogeneity (as %RSD) is determined by adding the subsampling and analytical variances together and subtracting that sum from the total variance. The square root of the variance is the standard deviation (SD), which is divided by the DU mean to obtain the RSD."

COMMENT 24 - PAINT AS A SOURCE OF ARSENIC

Historically, paints contained arsenic. This practice stopped in the 1950s. P[a]int colors containing arsenic include: Scheele's Green, and Paris Green. These two green pigments are now considered to be obsolete in architectural finishes (Crown, 1968, p.45-46).

Realgar and Orpiment are mineralogical names for Arsenic Orange and Arsenic Yellow pigments (Crown, 1968, p.198), and Arsenic Purple is a pigment also referred to as Cobalt Violet Light. Alternative names for these pigments abound, the following apply to either Scheele's Green or Paris Green: African Green, Deck Gruen, Emerald Green, English Green, King's Green, Leipzig Green, Meadow Green, Mineral Green, Mittis Green, Parrot Green, Patent Green, Schweinfurt Green, Swedish Green, Verde Ceniza, Vert Cendre, Viennese Green (Crown, 1968)

Were blue and or Green popular colors in the Bessemer Area? Yes, based on photographs take in the Bessemer area p. 20 of reference 1, "Forged Together in the Bessemer Neighborhood."

For example, the home located at 1605 Cedar is blue and historically, blue paint contained arsenic.

REQUEST: Please provide the arsenic content of soil for this home, near-by homes, and the area in general for comparison. I assume this would be included in the response to this comment.

Note that the public cannot confirm or identify similar issues because EPA has concluded that addresses are confidential and are not included in the RI report. Can EPA supply the soil arsenic and lead concentration of this particular property and adjacent properties? The photo graph was taken from p20 of "Forged Together in the Bessemer Neighborhood". There will be additional requests of this type as more information I gathered about the site history. This is important since old blue paint colors contained significant amounts of arsenic, as described above in comment 15.

EPA Response: *Information about arsenic containing pigments in various paints is noted. The property at 1605 Cedar Street is outside of the study area, and has not been sampled in conjunction with the Colorado Smelter Project.*

EPA policy number 2151.0 establishes EPA requirements for safeguarding the collection, assess, use, dissemination, and storage of personally identifiable information. EPA respects personal privacy whenever possible, while making available enough information about a Superfund investigation to apprise the public of the Agency's activities as it responds to any threats to human health and the environment that may be posed by the release or threat of release of hazardous substances. EPA Region 8 will release information to residential property owners about soil contamination at their property. If property owners choose to do so, they may in turn release that information to the public. EPA has released general information about soil contamination within the Colorado Smelter Superfund Site and, when it is available, EPA Region 8 will release general information in the form of a background study about lead and arsenic soil contamination in areas outside of the Site study area.

COMMENT 25

Stucco Homes and soil lead.

Note that stucco exteriors must be painted to minimize the weathering by precipitation. Without paint, the exterior stucco rapidly deteriorates. Since the stucco homes in the study area were built since the early 1900's, it is likely that they have been repainted several times in their first 100 years.

For re-painting, the old paint must be removed to ensure the paint is bonded to the stucco. This is performed by water, media (sand), or water-media blasting. It can be assumed that the removed paint, which would be very fine material, was not collected from the soil, and was not considered a health hazard (until recently). Any paint removed from the structure was simply left on the ground. Note that stucco houses are very prevalent in the Superfund Site area.

It does not appear that EPA is examining the collected soil sample for presence of paint chips. At least I cannot find it described in the available Sampling and Analysis Plans.

REQUEST**:** Please describe why EPA has not analyzed for or reported the presence of paint chips. This is very important because of the age of the homes in the study area. Does EPA have unreported data on paint chip sampling?

EPA Response**:** *The EPA does not have any unreported data on paint chip sampling for the Colorado Smelter Site. EPA expects that paint chips exist in some soils sampled at the site. The presence of a paint chip is not proof of the presence of a lead-based paint chip.*

The attribution of lead in residential soil in yards within Operable Unit 1 of the Colorado Smelter Superfund Site is not based on a belief that there were no paint chips, lead containing or otherwise. Attribution of the Colorado Smelter as a source of lead to residential soil in the study area was based on results of geospeciation samples that have shown that the source of these metals is predominantly pyrometallurgical and from smelting activity. Geospeciation data is reported in EPA Technical Memorandum, Geospeciation Technical Memorandum.

COMMENT 26 - Confidential Addresses

EPA has stated that the property addresses are confidential for the Remedial Investigation, and will not release them to the public for analysis.

I suspect this is because I previously personally visited each address in the Analytical Results Report (ARR) where addresses and photos of the homes were reported and found that the high lead properties were primarily stucco. Keeping addresses confidential must be a recent EPA internal policy since the near-by Blend emergency removal study of the Blend lead Smelter, listed the addresses, the name of the property owners, child age, and BLLs. An example table from the Blend Removal action report is given below. It not only provides addresses but the owners' names and ages of children (not included below) at the residence. Although the request for this documentation has been made several times, EPA Region 8 has not responded to this request. Note that the early investigation of the Colorado Smelter Site Analytical Results Report provided addresses and photographs of the homes investigated in the June 11, 2011 report.

REQUEST**:** Please provide electronic copies of the recent (after June 11, 2011 when EPA did release "personal" information) EPA policy and/or guidance that restricts the release of property addresses to the public in a Superfund investigation.

Note: The Addresses and photos of the homes in the June 22, 2011, ARR report were provided by EPA and were freely reported in the Blend Smelter Emergency Removal report (an example table is provided below).

This is an example of addresses and owners identity released by EPA R8. The table is from the Blend Smelter Emergency Removal report, 11/28/2011.

Owner	Address	Status				
		Access	Removal Plan	Excavation	Backfill	Restoration
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete
[redacted]	[redacted]	Granted	Approved	Complete	Complete	Complete

Note that the property owners' names and addresses were reported by the commenter; however, they were redacted per EPA policy were from this document.

<u>EPA Response</u>**:** *EPA policy number 2151.0 establishes EPA requirements for safeguarding the collection, assess, use, dissemination, and storage of personally identifiable information. EPA policy respects personal privacy whenever possible, while making available enough information about a Superfund investigation to apprise the public of the Agency's activities as it responds to any threats to human health and the environment that may be posed by the release or threat of release of hazardous substances. EPA Region 8 will release information to residential property owners about soil contamination at their property. If property owners choose to do so, they may in turn release that information to the public. EPA has released general information about soil contamination within the Colorado Smelter Superfund Site and, when it is available, EPA Region 8 will release general information in the form of a background study about lead and arsenic soil contamination in areas outside of the Site study area.*

COMMENT 27

Blood lead levels called “medically confidential” by local health department. I agree when the identity of a specific child is given. However, BLL summaries and other information (trends or average BLL for children in the Study area compared to not in the study area) have not been released to the public. However, an early CDPHE report, which I am still searching for, identified BLLs greater than 10 in Pueblo County but did not identify a single individual in the Superfund Study area with a BLL greater than 10μg/dL. Note that 10μg/dL is one of EPA’s soil cleanup (remediation) goals –“that no more than 10% of the children have BLLs greater than 10μg/dL”.

EPA Response: *Comment Noted.*

COMMENT 28 - Arsenic concentration in soil varies by the soil type

Analysis of soil sample data taken in the Eilers neighborhood indicate that a source of arsenic was application of arsenic-containing herbicides. Early in the investigation samples in lawns were taken at the 0-2-inch depth. When the 0-1 inch depth arsenic data was compared to the 0-2-inch data, the 0-2 inch horizon had a much higher arsenic concentration.

Lead arsenate formulations became more refined over time and eventually two principal forms were marketed: basic lead arsenate [$Pb_5OH(AsO_4)_3$] for use in certain areas in California, USA, and acid lead arsenate [$PbHAsO_4$] for all other locations.

The use of lead arsenate in the US continued until the mid-1960s. It was officially banned as an insecticide on August 1, 1988.

It is clear that arsenic in surface soil at the site may have resulted from residential use of lead arsenate compounds to control insects and undesirable vegetation in lawns.

Note that EPA reported arsenic levels in the 0 to 2-inch soil (areas where grass was present) is greater than in the 0 to 1-inch samples (where there is bare soil). This indicates that arsenic-containing herbicides were applied to grass to kill unwanted vegetation.

EPA stopped taking 0 to 2-inch soil samples after a short time. This change was not identified or discussed in a change to the QAPP.

REQUEST: Please add arsenic-containing herbicides to the revised CSM as a source of soil arsenic. Also explain why there was a change in the sample collection protocol that eliminated the 0 to 2-inch sample collection.

EPA Response: *The Colorado Smelter CSM currently considers the use of arsenic-containing pesticides. As noted in the RI QAPP, Worksheet #10, Colorado Smelter Baseline Conceptual Site Model, pages 50 and 51, “Primary sources of contamination which are considered for the Colorado Smelter Superfund Site include fugitive dust and particulate air emissions from the historic smelter stack and waste slag piles, solid wastes such as slag and slag-impacted soils, and liquid wastes such as process solutions, acids, and rinsates from historic facility operations. Secondary sources of contamination from the historic use of lead-based paint, leaded gasoline, and potential historic use of arsenical pesticides will also be considered.” Arsenic and lead containing paint has also been included as potential sources for these metals,*

> *“Arsenical pesticide use is a consideration for residential sampling locations. Statistical analysis, spatial analysis, metal ratios and possibly arsenic speciation will be used to evaluate potential elevated arsenic levels identified in OU1 and background soil samples (Folkes, et.al. 2001). Historic use of arsenic or lead-based paint will also be evaluated.”*

As described in the comment above, there is support for the possibility that arsenic containing herbicides were also used at the site. The potential for arsenic containing herbicides to contribute as a secondary source will be added to the CSM as part of the next RI QAPP revision.

During the DMA, surface soil samples were collected from two different intervals, 0 to 1 inch in locations without any ground cover, and 0 to 2-inches in locations with ground cover which was characterized as sparse or vegetated. The commenter is correct in noting that the interval sampled to characterize surface soil changed after the DMA. However, the assertion that this change was not documented in a QAPP is not accurate.

From the DMA QAPP, Worksheet #10, page "Because the thatch may be thick and soils tend to adhere to roots, the vegetated and grassy area depths will consist of: Surface (0-2 inches bgs); Subsurface 2-6 inches bgs ; 6-12 inches bgs, 12-18 inches bgs. To maintain consistency with the August 2003 EPA Superfund Lead-contaminated Residential Sites Handbook , bare soil area depths consist of: Surface (0-1 inches bgs); Subsurface 1-6 inches bgs ; 6-12 inches bgs, 12-18 inches bgs." Please note that ground cover was characterized as "bare, sparse, or vegetated" with both sparse and vegetated conditions sampled from 0 to 2-inches. It would not be accurate to characterize all of the 0 to 2-inch samples as having been collected from "lawn" areas.

The reason for initially planning sample collection using two different depths for surface soil is that there was concern about obtaining sufficient sample volume from 0-1" samples during the planning process for the DMA. This turned out not to be a problem, and as such, when planning for the RI, the sample collection intervals were simplified for consistency.

From the RI QAPP, Worksheet #10, page 52, "To maintain consistency with the August 2003 EPA Superfund Lead-contaminated Residential Sites Handbook, depths will consist of: Surface 0-1 inches bgs; Subsurface 1-6 inches bgs; 6-12 inches bgs; and 12-18 inches bgs."

COMMENT 29 - 30-POINT SAMPLING

The 30-point sampling approach was used at the Colorado Smelter Superfund Site. However, the approaches used at the site does not follow EPA guidance or the QAPP for the site investigation. (Guidance is partially reproduced below). I conclude, based personal on-site observation of the actually sampling (Sites 171 and 172) and available sampling log information that the 30-point sample approach is judgmentally based and not statistically derived.

The 30-Point approach (as described in the QAPP) indicates that the initial point is selected randomly and that a square grid pattern established to identify sample locations. That is acceptable, but apparently was not followed or documented.

Note that neither the initial point location nor the grid size are documented in field logs.

My in-the-field observations support that the initial sampling point for the grid were identified by the field crew leader using a judgmental approach and did not use an approach that had statistical input. In addition, my in-field measurements of the actual grid spacing (property 170) does not support a defined grid**.** I examined the field notes and identified 30-point sample areas where only 25 sample locations were documented. That means that 20 percent of the samples are from undocumented locations.

REQUEST: Please provide the size and shape of the grid used for each 30-point sampling event and identify the location of the "randomly selected" starting point. Also, describe whether the grid was square, rectangular, or other. The QAPP for the investigation shows a "perfectly" square grid which is in agreement with EPA's articles on 30-point sampling. Why was this not applied?

<u>EPA Response:</u> *Statistical input is not necessary to avoid judgmental sample locations. The sample increment locations are set up in a random grid within each decision unit, with goals to obtain*

increments across the decision unit. When triplicates were collected, the second and third locations are placed directionally away from the first location in a regular pattern by a specified (but approximate) direction. There was no attempt made to select specific locations that appeared to be more or less likely to have metal contamination (for example, by selecting areas of stressed vegetation or healthy vegetation preferentially). This approach constitutes a non-biased sampling approach. A perfectly square grid was not applied in most yards due to the size and shape of the decision units and the presence of yard features which required the grid to be adjusted. This is further described in the inorganic soil sampling Standard Operating Procedure, which is included in Appendix A of the RI QAPP.

Statements regarding decision units where the commenter states that only 25 sample locations were documented for 30-point samples are addressed fully in the response to Comment 30 below.

COMMENT 30

In order to confirm that 30 samples were actually taken when the field log identified 25 EPA concluded that 30 samples were actually taken by examining weights of the individual samples. EPA performed a review of the documentation and stated that a review of incremental sample weights were consistent with 30 collected increments (although only 25 locations were documented). Please provide the calculations (and confidence levels) that support that conclusion. This documentation is important since the QAPP states that the individual sample weights can vary between 5 and 50 grams. It was explained to the sampling group, when we questioned the number of incremental samples collected in the 30-sample areas where only 25 sample locations were documented. This means that for these areas 20 percent of the samples are from unknown (undocumented) locations. What effect does this have on the confidence of the resulting values?

Please explain how the incremental sample weights support the number of samples that were collected. Please provide all incremental sample weight data for the CAG Sampling Committee to support EPA's conclusion that the actual number of incremental samples collected was 30.

Note that the QAPP (p 59) provides a range of weights (5 to 50 grams for individual soil increments), which results in a total increment weight of 300 to 2500 g for the combined 30-point sample. The QAPP states: "When choosing the mass per increment, the field composite sample should typically weigh between 300 and 2,500 g after sieving soil samples to the target particle size."

REQUEST:

Please provide the actual weights of the incremental samples and the analytical methodology used to support the conclusion that 30 incremental samples were actually collected. This is important since the weight range is so large. "Individual soil increments (that make up an incremental sample) are expected to typically weigh between 5 and 50 grams each.

Also, the QAPP states that the first location of the 30 points will be determined randomly. Please describe the random process used and identify the first (randomly selected) point in the figures.2

EPA Response: *The process to assign the first point of the incremental sampling grid is described in the inorganic Soil Sampling SOP, which is included in Appendix A of the RI QAPP.*

The commenter previously contacted the EPA with a concern that not all 30 point samples collected actually contained 30 aliquots. The EPA reviewed field documentation to determine what had occurred in the field during sampling, to ascertain whether the samples had been collected correctly, and provided a detailed summary of the field documentation in question to the commenter. The weights of *samples were not examined as part of this review because the field documentation was sufficient to provide confidence in what had occurred during sampling.*

For clarity, the original comment and the original response from the EPA are reproduced below:

Comment 4

The Colorado Smelter investigation continues to use the PARCC parameters to support data quality. A preliminary analysis shows that the "completion" parameter is likely lacking:

In the Colorado Smelter DMA study, it was stated that 30- and 5-point samples would be collected to confirm that 5-point approach is equal to the 30-point approach.

When the number of samples collected for the 30 point analysis is examined, There was about 50 percent completion based on the following available data. There were apparently 8 locations for 30-point samples. Only 5 of the locations had 30points, based on the field notes. The field notes are prepared so investigators do not have to rely on their memory and I believe are the most accurate record.

<u>Response to Comment 4:</u> *The DMA QAPP worksheet 17 indicates that "8-10 DUs will be selected (excluding special DUs as defined below) and will have a sample and 2 replicates taken for the 30-increment design for the 0-1" or 0-2" (bare vs. vegetated soil) interval and 1-6" or 2-6" intervals. A single DU will also be designated to include a sample and 2 replicates taken for the 30-increment design for the entire 0-18" interval." (PWT 2015a)*

Completion of the proposed incremental sampling can be measured directly against this QAPP requirement: the upper two depth intervals at 8 DUs were sampled in triplicate with the incremental sampling design, and one DU was sampled to full 18" depth using the triplicate incremental sampling design. This represents 100% completion of the proposed incremental sampling. Additionally, one specialty DU (the play area at PC-1592) received triplicate incremental sampling although it was not proposed in the initial sampling design.

Property	*DUs sampled with triplicate 30-pt incremental sampling*	*0-1 or 0-2*	*1-6 or 2-6*	*6-12*	*12-18*
PC-0269	*Side Yard*	*yes*	*yes*		
PC-0389	*Back Yard*	*yes*	*yes*		
PC-0423	*Side Yard East*	*yes*	*yes*	*yes*	*yes*
PC-0423	*Back Yard*	*yes*	*yes*		
PC-1076	*Back Yard*	*yes*	*yes*		
PC-1504	*Front/Side Yard*	*yes*	*yes*		
PC-1504	*Back Yard*	*yes*	*yes*		
PC-1615	*Back Yard*	*yes*	*yes*		
PC-1654	*Front Yard*	*yes*	*yes*		
PC-1592	*Play Area Sand - single depth interval*				

Additional clarifications regarding incremental sampling and field documentation:

PC0389 *– This property was sampled on 5-13-2015 by two crews of soil samplers. The first crew arrived at approximately 9:00 am and began sampling the yard. When the second crew arrived to help finish the property (around 2:40 pm), they started a new sampling form numbered page 1 of 3 and a new sample sketch. 5-point composite samples were collected in triplicate from all*

DU's, including a triplicate 5-point composite sample from the back yard DU (all 4 depths), and triplicate 30 point incremental samples were collected from the upper two soil intervals in the back yard DU (0-1" and 1-6"). This means that 6 individual 30-point composite samples were collected from this back yard, along with 12 individual 5-point composite samples.

The field paperwork was reviewed when the field sampling team returned to the field office. In this case, several errors were identified with sample names on the field forms, and they were corrected. Other than the discrepancies with sample ID's, the field forms were found to be generally correct and complete. Page 1 of 3, which was filled out by the sampling crew who arrived at the property at 9:00 am, indicates that 30 holes contributed to back yard samples S0389-BY-0001-31, S0389-BY-0106-31, S0389-BY-0001-32, S0389-BY-0106-32, S0389-BY-0001-33, S0389-BY-0106-33. This positively identifies that these samples each contained 30 increments.

Because each team of soil samplers completed paperwork, there were two sketches for this property. An attempt was made in the field office to combine the information on these two sketches, however, in marking the approximate locations of holes for the back yard incremental samples, the sampler only indicated that sample aliquots were generally collected in a grid pattern, and failed to mark all 30 spots with an asterisk. We are confident that the sampler intended to mark 30 locations, because this individual provided a key to the sketch, showing the symbol used to mark approximate increment collection locations and stating "30- pt increment triplicate."

The other field sketch correctly indicates that 30 increment triplicate sampling was conducted in the back yard along with triplicate 5-point composite sample collection. Although one of the 4 locations on the field forms where the field sampler should have indicated 30 increments for these samples shows only 25 locations, we are confident based on inspection of the rest of the field documentation that these samples were collected correctly.

***PC1076** – This property was sampled on 5-18-2015. Triplicate 30-point composite samples were collected in the upper two intervals of the back yard, along with triplicate 5-point composite samples.*

***PC1504** – This property was sampled on 5-11-2015. Triplicate 30-point samples were collected from the front yard DU and from the back yard decision unit. A total of 12 individual 30-point samples were collected at this property. The field forms and sketches correctly indicate the approximate locations of the 30 aliquots collected for each sample from each of these DUs. PWT Standard Operating Procedure PWT-COS-DMA-427 describes the procedure for surface and shallow subsurface soil sampling for inorganics, and is included in Appendix A of the EPA approved DMA QAPP. Section 4.1 of the SOP explains that DUs were assigned by the EPA in advance of soil sampling. Section 4.2 describes in detail the process for incremental sample collection. Section 4.2, item 2 describes laying out an approximate grid and marking it with pin flags to define the 30 aliquot collection points. It states "Note: every three feet is an approximation that should be appropriate in most yards in the study area. For yards which are significantly larger or smaller, samplers should <u>adjust the grid spacing as necessary to obtain 30 aliquots</u>." (Underlining added for emphasis). Because the front and back yard DUs at property PC1504 were not perfect rectangles, it was necessary to adjust the locations of aliquot collection to cover the entire space that these samples were intended to represent. As noted in the comment, aliquots from the back yard were spaced to cover the entire back yard (the area on both sides of the sidewalk). Similarly, sample aliquot locations were adjusted as necessary in the front yard to obtain 30 total aliquots and represent the full area included in the decision unit.*

Assignment of DUs is guided by the idea of exposure units as they are applied in the risk assessment. DUs are intended to represent areas of the yard which are treated or covered in a similar manner, and which are likely to have similar uses and resident exposures. Considering this, it is not necessary that a DU be rectangular in shape. It is also acceptable for a DU to be located on both sides of a sidewalk or another feature which is not sampled (concrete slab), or a decision unit which is being sampled separately. For example, a back yard decision unit might surround a play area decision unit, or be bisected by a garden decision unit, and still be a single back yard.

The 12 incremental samples which were collected at this property are found to be correct and complete based on inspection of the field documentation.

***PC1592** – This property was initially sampled on 5-15-15, with triplicate 5-point composite samples collected from the front yard, back yard, and play area DUs. Samplers collected native soil from immediately below the sand in the play area. A single 5-point sample was collected from the imported material in a garden on the property. These sample results were intended to provide information about the nature and extent of contamination in the native soils in the yard. This represented 100% completion for collecting all the samples planned to be collected from that property.*

On 5-28-2015, samplers returned to the property and collected triplicate 30-point incremental samples from the play area sand. These additional samples were intended to provide information about the concentrations of metals the residents might be exposed to when using their yard.

At property PC1592, 40 five-point composite samples and zero 30-point incremental samples were proposed to be collected. Based on preliminary results from the initial sampling on 5-15-15, additional samples were collected on 5-28-15. A total of 40 five-point composite samples and three 30-point incremental samples were collected, achieving over 100% completeness for sample collection from this property.

***PC1615** – This property was sampled on 5-15-2015. Triplicate 30-point composite samples were collected from the upper two depth intervals in the back yard DU. There is a discrepancy on the field forms, such that on page 1 of 3, the field sampler clearly indicates that 30 holes contributed material to back yard samples S1615-BY-0002-31, S1615-BY-0206-31, S1615-BY-0002-32, S1615-BY-0206-32, S1615-BY-0002-33, S1615-BY-0206-33. However, on the field sketch, there are only 27 marks indicating approximate aliquot collection locations in the back yard. Although sampler memory is certainly a less reliable record of events that written field documentation, in cases where there is a simple discrepancy like this, it is sometimes appropriate to ask the field sampler what might have occurred. In this case, in addition to the information on page 1 of 3 indicating that 30 aliquots were collected for these samples, the field sampler was contacted. His recollection is that there were no occasions during the DMA (or during subsequent RI sampling) where a number of aliquots between 5 and 30 was used to make up a sample. Samples either had 5 increments, or they had 30 increments. This statement, along with the field documentation on page 1 of 3, provides confidence that the 30-point incremental samples collected at PC1615 contained the proper number of soil increments, despite the error on the field sketch.*

COMMENT 31 - LEAD AND ARSENIC DISTRIBUTIONS OF EPAs COLORADO SUPERFUND DATA

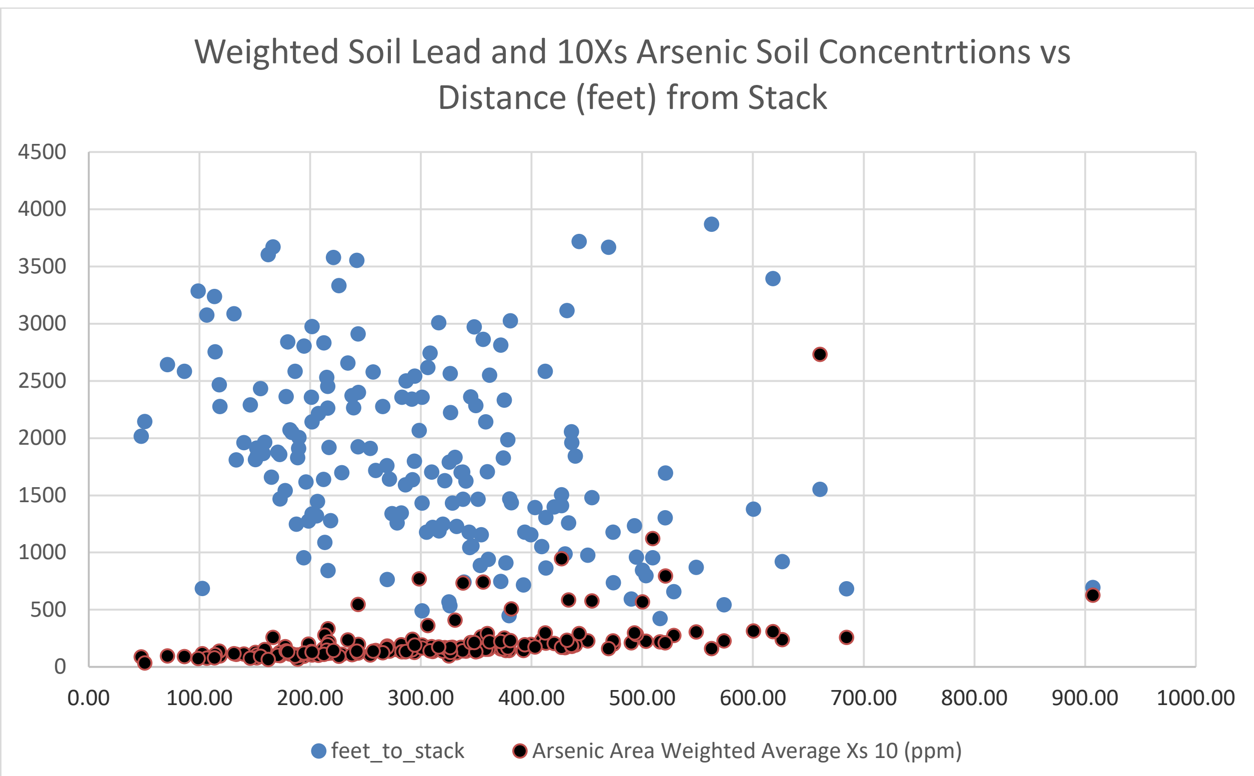
EPA stated in the 2010 ARR

P 21: "As anticipated, the concentrations of lead decrease with distance from the site."

Note that when EPA's weighted average yard soil lead data are plotted versus the distance from the Smelter Stack that there is no pattern of decreasing lead concentrations with distance from the stack. These data do not not support EPA's conclusion that stack (and fugitive dust) emissions were the primary source of lead in soil in the study boundaries.

I had a reference for lead plumes from secondary lead smelters, but misplaced it. It demonstrated that the plume was down wind and extended less than 1 mile. I will provide that reference at a future CAG meeting if EPA does not have a similar reference.

The following Figure (Weighted soil Lead and 10Xs Arsenic Soil Concentrations vs Distance (feet) from Stack) displays the area averaged lead concentration for yards sampled versus distance from the stack. The soil lead concentrations and distances from the "primary or tallest stack" are for individual yards were provided by EPA R8. It is true that this this single tallest stack was not the only smelter source of contamination, however, this analysis is applicable to all smelter sources because of their proximity within the smelter area. Note that the combined sources (including fugitive emissions) would have been disbursed in a similar manner. The weighted average arsenic concentration has been multiplied by 10 in order to display any trends. Otherwise, the arsenic data would be a nearly straight line at the bottom of the figure and concentration trends would not be detectable. This figure and the data show that the weighted average soil arsenic concentration actually increase with increasing distance from the smelter (stack). This analysis demonstrates that the smelter is not a major source of soil arsenic in the study area and that other arsenic sources (herbicides, pesticides, and Paint) are the contributors of arsenic.



The weighted soil lead concentrations do not show an expected trend of lower concentrations with increasing distance from the smelter stack. This not unexpected, since the study area contains many very old homes built before LBP was banned. These data support position of soil lead data taken from an area of older homes.

3) At a CAG meeting two large maps were displayed providing lead and arsenic concentration distributions. EPA provide electronic copies of those maps for review and analysis. When the arsenic and lead maps are slightly offset combined (shown in the Attachment 7): It appears that the high concentrations of the two metals are not related, since the high lead and high arsenic concentrations are not at the same locations.

Interpretation of these maps makes it unlikely and difficult to conclude that lead and arsenic came from a single dominant source, such as smelter stack emissions or smelter operations that generate fugitive dust. Note that this conclusion would be "professional judgement" and would be different for different professionals.

REQUEST:

I would appreciate EPA's interpretation of the combined map, which was prepared from two EPA-prepared maps explain how it supports EPA's assumption that a single area (the smelter) was the primary source of soil lead and soil arsenic. Perhaps EPA could use actual concentrations to clarify the data and provide a better picture of the distributions? This would be a definite plus for public understanding.

Examination of the combined map led me to examine correlation coefficients for metals.

4) The correlation coefficient between lead and arsenic concentrations for the 310 properties for which I used, is 0.499. Note that I may not have all the available data. However, the correlation coefficient does not indicate a high relationship between the two metal concentrations. I conclude that arsenic and lead are not from a single point source.

REQUEST: EPA please provide written rationale to support the position that the map and corresponding correlation coefficients support the smelter as the single (or dominate) source of lead and arsenic to the soil.

<u>EPA Response:</u> *The provided map and scatter plot are noted. As mentioned previously, the EPA cannot appropriately respond to comments regarding statements in documents written by other federal, state or local agencies. However, to the extent possible, the EPA will attempt to respond to the underlying concern identified in the comment above.*

The distribution of arsenic and lead is affected by multiple differences between the two metals, including relative weight, solubility at different soil pH conditions, and the fact that lead is an economic resource, which smelters typically try to capture and sell, while arsenic was purely a waste product. Soil pH conditions which tend to mobilize arsenic will cause lead to remain immobile in the soil column, while the opposite is also true. Arsenic particulates will tend to float on the air longer, traveling further before beginning to settle out onto surfaces than heavier lead particulates do. Due to these factors, the results described are not unexpected by EPA, and do not contradict the evidence that historical operations at the Colorado Smelter were a significant source of lead and arsenic to the study area. Source attribution is further supported by geospeciation samples that have shown that the source of these metals is predominantly pyrometallurgical and from smelting activity. Geospeciation data is presented in EPA Technical Memorandum, Geospeciation Technical Memorandum.

COMMENT 32

The 30-point and 5-point samples (taken in the same area) do not follow statements in the QAPP for this investigation or EPA guidance. The 30-point samples were not taken on a defined grid pattern as identified in the QAPP (the lack of a defined grid pattern is shown in field notes and diagrams) Note that the initial point, which was to be located randomly was not identified. A defined grid based on a randomly selected staring point is necessary to ensure that all potential sampling locations have an equal probability of being selected. However, the actual "grid" sample locations were identified judgmentally (or authoritatively) and that approach does not allow all potential sample locations in the sampled area to have an equal chance to be sampled.

<u>EPA Response:</u> *Incremental sampling was conducted in accordance with the Inorganic Soil Sampling SOP, which is included in Appendix A of the RI QAPP. The SOP does not require that the initial grid point be identified on the sketch. The EPA appreciates that the difference between a judgmental and statistical sampling approach is not completely straightforward, which could cause confusion on this topic. As described in the DMA QAPP and in the RI QAPP, yards within the study area are being sampled individually on a decision unit (DU) basis. The determination or assignment of DUs is based on natural divisions within each specific yard such as front yard, back yard, drip zone, play area, etc. When sample aliquots are collected, no attempt is made by the field team leader to select a location within a DU which is more likely to contain contamination. Therefore, this is not a judgmental sampling approach. Instead, per the SOP, the field team selects locations in order to get the correct number of aliquots and generally cover the entire physical area of the DU. Therefore, it is appropriate to use these sample results to characterize an entire DU, whether the DU is a small drip zone, or the outfield of a ball park.*

In contrast to the approach used at Colorado Smelter, a hypothetical judgmental residential yard sampling approach might be to select aliquot locations within the apron (where slag was observed on the ground surface, or stressed vegetation was observed), to identify the highest concentrations expected to be found in that yard. If this approach had been taken, it would absolutely not be appropriate to use those apron sample concentrations to extrapolate to the entire yard.

Hopefully this explanation is helpful in clarifying the commenter's concern that judgmental sampling was being applied inappropriately to this site. The EPA concurs that a judgmental approach to sampling would not be appropriate for characterizing overall concentrations within a yard, nor would it be appropriate to take sample results from a few yards nearest the historical smelter and extrapolate the results to the entire study area.

COMMENT 33

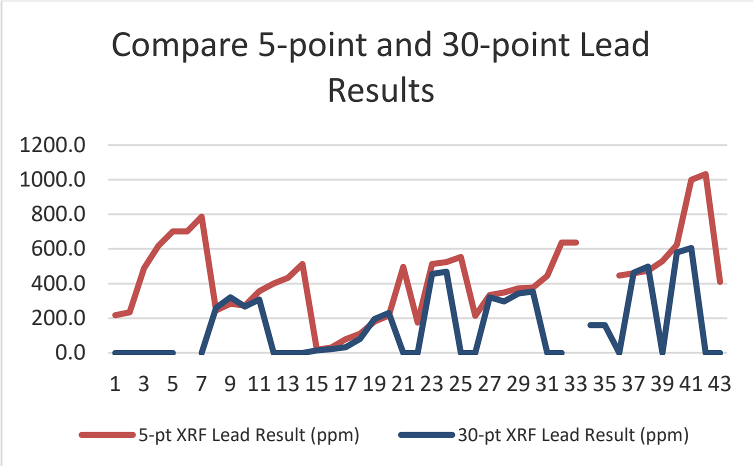
EPA guidance on using and the limitations of judgmental sampling is provided in EPA QA/G-5-S, which is reproduced in part below:

Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan

Quote from: EPA QA/G-5S

"1.3.1 Authoritative Sampling

> Judgmental (or Samples collected in areas suspected to have higher contaminant authoritative) samples concentrations due to operational or historical knowledge. Judgmental samples <u>**cannot**</u> be extrapolated to represent the entire site.
>
> Note that judgmental samples were extrapolated to entire areas, including parks.
>
> Early in the investigation EPA released comparative data for 30-point and 5-point sample data (these data are reproduced in Attachment XX
>
> Graphic comparisons, below, of the data for lead concentrations do not appear to show good agreement between the lead concentrations in 30- and 5-point samples:



I Request that EPA statistically and graphically compare all available 5- and 30-point sampling data to demonstrate that they are equivalent, as stated in their reports.

30-point

I Request that EPA explain how their <u>judgmental 30-point samples</u> can be used to support decision-making concerning average metal concentrations over the sampled area. This is requested because EPA QA/G-5S, cited above indicates that judgmentally collected sample data cannot even be averaged. That is what happened when the samples were combined.

The following statement from the above guidance describes the limitations of judgmental sampling and how the results can be used:

> "With authoritative (judgment) sampling, an expert having knowledge of the site (or process) designates where and when samples are to be taken. <u>This type of sampling should only be considered when the objectives of the investigation are not of a statistical nature</u>, for example, when the objective of a study is to identify specific locations of leaks, or when the study is focused solely on the sampling locations themselves. Generally, conclusions drawn from authoritative samples apply only to the individual samples and aggregation may result in severe bias and lead to highly erroneous conclusions. Judgmental sampling also precludes the use of the sample for any purpose other than the original one. Thus if the data may be used in further studies (e.g., for an estimate of variability in a later study), a probabilistic design should be used."

<u>EPA Response:</u> *The EPA appreciates that the difference between a judgmental and statistical sampling approach is not completely straightforward, which could cause confusion on this topic. As described in the DMA QAPP and in the RI QAPP, yards within the study area are being sampled individually on a decision unit (DU) basis. The determination or assignment of DUs is based on natural divisions within each specific yard such as front yard, back yard, drip zone, play area, etc. When sample aliquots are collected, no attempt is made by the field team leader to select a location within a DU which is more likely to contain contamination. Therefore, this is not a judgmental sampling approach. Instead, per the SOP, the field team selects locations in order to get the correct number of aliquots and generally cover the entire physical area of the DU. Therefore, it is appropriate to use these sample results to characterize an entire DU, whether the DU is a small drip zone, or the outfield of a ball park.*

In contrast to the approach used at Colorado Smelter, a hypothetical judgmental residential yard sampling approach might be to select aliquot locations within the apron (where slag was observed on the ground surface, or stressed vegetation was observed), to identify the highest concentrations expected to be found in that yard. If this approach had been taken, it would absolutely not be appropriate to use those apron sample concentrations to extrapolate to the entire yard.

Hopefully this explanation is helpful in clarifying the commenter's concern that judgmental sampling was being applied inappropriately to this site. The EPA concurs that a judgmental approach to sampling would not be appropriate for characterizing overall concentrations within a yard, nor would it be appropriate to take sample results from a few yards nearest the historical smelter and extrapolate the results to the entire study area.

Further, the commenter makes a specific request that 5-point and 30-point sample results be compared, both statistically and graphically. Analysis and comparison of the results for 30-point and 5-point samples is presented in the DMA Data Summary Report, which is available online at: https://semspub.epa.gov/work/08/1720000.pdf

The EPA is not electing to conduct additional analyses of these data at this time.

COMMENT 34 - SOIL TYPE

At CAG meetings, I have asked about the soil types identified in the investigation. It was indicated that soil type was not a subject to be determined in the investigation.

However, P 100 of 100 – DMA Final states; "Sufficient properties should be selected for field replication so that there is confidence that either

1) all DUs for all properties have similar soil heterogeneity, or

2) soil heterogeneity varies with depth and/or by the property's soil type."

Soil type is critical when evaluating soil arsenic content and apparently EPA has either not collected the data or reported soil types in the Superfund area or background soils.

The publication: Determining Arsenic Distribution in Urban Soils: A Comparison with Nonurban Soils", by Tait Chirenje':, L.Q. Ma', and E.J. Zillioux The Scientific World Journal (2002) 2. 1404-1417 ISSN 1537-744x; DOI 10. i100/t~~.2002.i87 provides the following table of soil types and arsenic concentration ranges:

Table 1. General Ranges of Arsenic Concentration in Different Types of Soil

Soil type	Range (mg/kg)
NATURAL UNDISTURBED SOILS	
Alluvial soils	2.1-22.0
Chemozerms and dark prairie soils	1.9-23.0
Clay and clay-loamy soils	1.7-27.0
Forest soils	1.5-16.0
Light desert soils	1.2-18.0
Light loamy soils	0.4-31.0
Lowss & soils on silt deposits	1.9-16.0
Organic light (or rich) soils	0.1-48.0
Silty prairie soils	2.0-12.0
Soils on glacial till and drift	2.1-12.0
Soils over granites and gneisses	0.7-15.0
Soils over limestones/calcareous rocks	1.5-21.0
Soils over volcanic rocks (or ash)	1.0-93.2
URBAN SOILS	
Gainesville, Florida	0.22-660
Miami, Florida	0.22-110
Adelaide, Australia	0.2-16
Sydney, Australia	0.60-11.0
Ontario, Canada	0.50-47
Denver, Colorado	1.1-1,000

The range of arsenic concentrations in natural undisturbed soils ranges from 0.1 to 93.2 mg/kg and the range in urban soils ranges from 0.2 to 1,000 mg/kg. It is concluded that soil type and should have been part of the investigation, as indicated in the DMA final report. It is also important since various metals migrate differently in different soil types. For example, while lead is relatively immobile, arsenic is fairly mobile in alkaline soils (should EPA not have technical references or data to support this statement, they are available on written request).

Note that the November 2015 Uniform Federal Policy Quality Assurance Project Plan, only discusses soil type in section 4.4 under desegregation (breaking up of "clumps" of soil after drying. It is recommended that soil type be determined since it is important when determining arsenic concentrations in soil.

EPA Response: *The statement that "soil type should have been part of the investigation, as indicated in the DMA final report" is not accurate. The statement from the DMA QAPP, quoted in the comment above, was included in that document to ensure that soil heterogeneity was evaluated for the yards in the study area to ensure that the sampling design the DMA demonstrated was adequate (a single 5-point composite in most decision units, with 5% triplicate frequency, and 30 point incremental samples collected only when DU size exceeded 5,000 sf) would in fact be sufficient to characterize soil concentrations throughout the study area.*

"Sufficient properties should be selected for field replication so that there is confidence that either 1) all DUs for all properties have similar soil heterogeneity, or 2) soil heterogeneity varies with depth and/or by the property's soil type. Field heterogeneity (as %RSD) is determined by adding the subsampling and analytical variances together and subtracting that sum from the total variance. The square root of the variance is the standard deviation (SD), which is divided by the DU mean to obtain the RSD."

When the quote is read in the context of the paragraph where it appears in the document, it becomes clear that soil type has been considered appropriately in the course of this investigation.

While various soil types may have a greater or lesser tendency to retain soil arsenic as indicated in the table provided above, this does not mean that soil type is necessary for determining arsenic concentrations. The process by which the concentration of arsenic is measured in the laboratory is not soil type dependent. Soil type was not included as a subject of the investigation because it is not necessary to achieve the project DQOs.

COMMENT 35

Determining the current site study boundaries does not consider prevailing wind direction as was performed in past boundaries. The 2010 SAP does consider the prevailing wind direction, based on the following quote, which was taken from the 2010 Sampling and Analysis Plan, Colorado Smelter – CON000802700, which states:

P10

"The study area consists of neighborhoods located within 1-mile of the site and surface waters within 15 miles downstream of the Probable Point of Entry (PPE) of the site. Within the 1-mile radius the study area primarily includes residences to the southeast of the site in the **direction of prevailing winds."**

Also, P, 15 of SAP states:

"Houses located southeast of the site will be the focus of the investigation since prevailing winds are from the northwest. Additionally, the density of sampling will be higher closer to the site and less dense as the distance from the site increases.

"Prevailing winds at the Colorado Smelter during the time of operation were out of the north and northwest as noted on Sanborn Fire Insurance Maps for the years 1883-1904. Wind rose diagrams from a meteorological station located just south of the Colorado Smelter on the Rocky Mountain Steel Mill for the time periods January 1, 2003 - December 31, 2005, and March 1, 2008 - February 28, 2009, show prevailing winds out of the west- northwest, supporting this general wind direction. AOC A is located within 1,800 feet of the northern (and most distant) smoke stack and within 1,663 feet of the southern (and closer) smoke stack (see Figure 1 of this support document). The proximity of the stacks to AOC A, along with the historic prevailing wind direction, provide additional evidence that at least a portion of the significant increase in lead and arsenic in AOC A is attributable to the Colorado Smelter stacks. This attribution is also corroborated by the 1995 ARR for the Santa Fe Avenue Bridge Culvert study and the study of the metal content of surface soils in Pueblo conducted by affiliates of Colorado State University and published in 2006 (the Diawara study).

Houses located southeast of the site will be the focus of the investigation since prevailing winds are from the northwest. Additionally, the density of sampling will be higher closer to the site and less dense as the distance from the site increases."

However, EPA significantly expanded the study area to the south and west without considering or including analysis of the local wind's dominant direction.

Note that Figure 6 of the PA shows background samples (SO-1, which is up wind) was taken from an area that is now within the study area.

EPA provided no explanation or the rationale for the site boundaries that do not consider or provide a rational about wind direction in relation to the Superfund study area boundaries.

Also, note that the expanded study area focusses on areas that have older homes constructed before LBP was banned. The current study boundaries are shown below:

The study boundaries described in the 11/11/15 QAPP are described below:

"What are the boundaries of the study (this corresponds to traditional DQO process step 4, "Define the boundaries of the study")? The study area consists of approximately 1,900 homes and other properties located within a 0.5mile radius of the former smelter. The 0.5-mile radius is a preliminary study area based on the distance between the Colorado Smelter and the edges of the neighborhoods to the east, south, and southeast. The study area boundary may be increased or decreased as data is collected. Surface and subsurface soil, and indoor dust are the matrices of concern within this project boundary. Each of these matrices is detailed separately below for the remainder of the PQOs." Project quality objectives (PQOs) in terms of type, quantity, and quality of data determined using a systematic planning process (note that PQOs correspond to DQOs in a traditional approach).

<u>REQUEST</u>: **Please provide written rationale why the study focus area boundaries are not related to or dependent on available wind rows information, but instead focused on areas with older homes that were more likely to have LBP and resulting high soil lead levels. Also, explain how the PA was incorrect in identifying sample SO-1 as "background".**

<u>EPA Response:</u> *The comment identifies a difference between the boundaries for the CDPHE study in 2010, and the EPA established Superfund site boundaries. The 2010 CDPHE study area, study goals, and sampling design are outside the scope of this EPA lead effort. The EPA Superfund Site study area boundaries are also outside the scope and detail of the Proposed Plan.*

However, available wind rose data has been considered throughout the project. Reference 26 of the HRS listing package includes wind rose plots for the Pueblo Airport prepared by the Western Regional Climate Center for the periods from 1942 to 1969, 1970 to 1989, and 1990 to 2012. Additional wind *rose plots from the Rocky Mountain Steel Mill for the time period from 2003 to 2005 and from 2008 to 2009 were also included as Reference 46 associated with the HRS listing package.*

It is noteworthy that the predominant wind direction in the vicinity of the site has shifted dramatically in the last 75 years. Changes in wind patterns, as well as the current climate conditions at the site were considered when establishing the site boundary.

*The last statement in the comment, "**Also, explain how the PA was incorrect in identifying sample SO-1 as "background"**" is also a reference to a specific sample within the CDPHE report. The designation of background by CDPHE was relative to the specific area and goals of that study. However, the current EPA-lead RI has different specific data quality objectives and study goals, informed by the data collected after CDPHE planned their sampling effort, and documented in the RI QAPP.*

Based on these current RI data quality objectives and current site information, the sample SO-1 would not be considered representative of background concentrations.

However, the EPA is in the process of planning a background study for the Colorado Smelter Site, which is expected to provide significant and useful information regarding background concentrations of metals in the study area vicinity.

COMMENT 36

The May 10, 2010 Sampling and Analysis Plan (SAP) discussed the DQO process, but simply listed the steps in the DQO process. There was no documentation that the steps were performed. Comments are made below on several parts of the DQO section.

For example:

STEP 1 – THE PROBLEM STATEMENT

The problem statement is:

1) Is contamination from historic smelting still present onsite and

2) has contamination migrated to residential areas and nearby surface water bodies?

REQUEST: Please identify the smelting contaminants referred to. For example, does this include PAHs, which would have resulted from the combustion processes at the smelter? Does this include liquid wastes that may have been disposed? There are many other contamination issues that could potentially be addressed. The concept of the DQO process is to precisely identify the issues (Problem statement.)

Note that the Guidance for the DQO process states that Step 1 should; give a concise description of the problem, (I don't find that in the problem statement) and develop a conceptual model of the environmental hazard to be investigated? (I do not find a CSM in the EPA DQO section).

Please revise the SAP to be in agreement with EPA guidance (February 2006, Guidance on Systematic Planning Using the Data Quality Objectives Process

EPA QA/G-4),

STEP 2 – IDENTIFYING THE DECISION

The primary study questions for this investigation are:

(1) Do the slag piles contain concentrations of metals elevated above background?

(2) Do residential yard soils contain contamination at concentrations above health-based benchmarks that are attributable to the former smelter site? (Note there is no information describing how attribution would be analyzed, confirmed, or criteria that explains how EPA will do this.)

(3) Are onsite and nearby surface waters and sediments adversely impacted by the former smelter?

REQUEST: Please revise this SAP to be in agreement with the 2006 DQO guidance, including the title of step 2. See excerpt below:

The 2006 DQO Guidance identifies Step 2 as "Identify The Goals of The Study, and includes: Identify principal study question(s),Consider alternative outcomes or actions that can occur upon answering the question(s), For decision problems (which I believe this is) develop decision statement(s), organize multiple decisions

REQUEST: Please identify the study goals.

Step 3. Identify Information inputs.

Response: Please redraft this Step to be in agreement with EPA guidance.

The issues included are: 1) Identify types and sources of information needed to resolve decisions or produce estimates, Identify the basis of information that will guide or support choices to be made in later steps of the DQO Process, and Select appropriated sampling and analysis methods for generating the information.

STEP 4 – DEFINE THE STUDY BOUNDARIES

The study area consists of neighborhoods located within 1-mile of the site and surface waters within 15 miles downstream of the Probable Point of Entry (PPE) of the site. Within the 1-mile radius the study area primarily includes residences to the southeast of the site in the direction of prevailing winds. Background soil will be collected from an area not likely to be impacted by the smelters that historically operated in Pueblo.

REQUEST: Please revise this section to be in agreement with EPA guidance, including the title of Step 4, which should be Step 4. "Define the Boundaries of the Study". This section should:

1) **Define the target population of interest and its relevant spatial boundaries, Define what constitutes a sampling unit, Specify temporal boundaries and the practical constraints associated with sample data collection, and Specify the smallest unit on which decisions or estimates will be made.**

REQUEST: Please discuss the 1-mile radius and how the 1-mile radius designation disregards prevailing wind direction. Please explain why prevailing wind direction is not considered. Note that the above study boundaries definition does identify that issue, but it was apparently ignored.

The current documents state :STEP 5 – DEVELOPING DECISION RULES In general sample results will be compared to background samples to determine if an observed release or observed contamination can be documented (generally defined at three times background for the purpose of demonstrating attribution to the site) as defined in the Hazard Ranking System (HRS). Contaminants not meeting this threshold may not be considered for scoring the site under the HRS. Additionally, sample results will be compared to Superfund Chemical Data Matrix (SCDM) benchmarks to establish Level 1 contamination as defined by the HRS and other appropriate benchmarks such as CDPHE's residential soil cleanup table value standards (CDPHE HMWMD 1997). Results from samples collected at residential properties will be shared with property owners and house occupants and if metals concentrations exceed applicable benchmarks, then CDPHE may recommend additional action."

Request: Please revise this section (Step 5) to agree with EPA guidance. The title of Step 5 should be: Develop the Analytical Approach.

The individual steps include: Specify appropriate population parameters for making decisions or estimates, Choose a workable Action level and generate an "If…then…else" decision rue which involves it.

STEP 6 – DEFINING TOLERANCE LIMITS ON DECISION ERRORS

Judgmental sampling will be used to bias samples toward more potentially contaminated areas. For yard soil sampling, multi-increment samples will be collected to more accurately reflect the average concentration of the sampling zone. All analytical data will be reviewed, verified, and validated to ensure data are acceptable for the intended use.

Apparently, decisions were not defined (because the DQO process was determined to be "Not Applicable"). The decision section simply stated questions. Decisions, when defined can only be answered "yes" or "no". Otherwise it is not a decision. (Please disagree if you do, but document, using EPA guidance to support the disagreement.

REQUEST: Please revise this section to be in agreement with EPA DQO guidance. For decision Problems, which I believe this is) specify the decision rule as a statistical hypothesis test, examine (and document) the consequences of making incorrect decisions from the test, and place acceptable limits on the likelihood of making decision errors (this is similar to acceptable uncertainty in the decision).

REQUEST: EPA please respond to the following specific comment.

The SAP for the initial study DMA report, stated that DQOs were "NA" (Not Applicable?). However in the Analytical Results Report, Table5-3 a heading in the table is: "Clear Decision?" That column simply contains either "yes" or "no". Note that the decision is not defined although decision is mentioned several times in the report. Please provide the definition of the above decision in the report, the criteria, and the confidence level for determining "yes" or "no". The meaning of "Clear". Is not provided or discussed. Please provide.

REQUEST: EPA, please respond to this question: How do you confidently identify (at an identified level of confidence distinguishing between lead from smelter and LBP?)

<u>EPA Response:</u> *The first several parts of this comment refer to a 2010 sampling plan produced by CDPHE, not to an EPA document. EPA is not currently aware of any sampling being conducted under this 2010 sampling plan, and as such does not see value in revising the document at this time. However, if revisions to the 2010 CDPHE sampling plan were to be undertaken, that effort would not be an EPA effort, but would instead be conducted by CDPHE.*

However, the EPA can respond to the final two requests made in Comment 36.

The Demonstration of Methods Applicability (DMA) sampling design is outside the scope and detail of the Proposed Plan. However, the Data Quality Objective (DQO) systematic planning process was followed for both the DMA and the Remedial Investigation (RI) sampling efforts.

The example referred to in the comment seems to be confusion caused by a note in a text block on Figure 1, which states "Conduct systematic planning (Attachments B and C – Not applicable to this DMA)."

This note was not intended to imply that systematic planning is not applicable to the DMA, rather it was intended to communicate that Attachments B and C are not applicable. Page 8 of 100 in the DMA QAPP explains that "Figure 1 is a summary flowchart that outlines this DMA process. ***Where applicable****, the figure is supported by a series of attachments that provide additional detail on the project activities to be performed at key milestones of the project." (bold added for emphasis). Not applicable in the text box indicates that the DQO process is not documented in Attachments B and C, nothing more.*

As indicated on page 13 of the DMA QAPP, Attachment B, when applicable, would contain the systematic planning meeting agenda, and Attachment C would contain the CSM (conceptual site model) and data gap assessments conducted during systematic planning. Attachment B, the agenda(s) for the systematic planning meetings held on February 27, 2015 and March 24, 2015 (documented in the DMA UFP-QAPP, Worksheet #2, #9a and #9b) was listed as not applicable because a formal agenda was not prepared in advance of these meetings. Attachment C was listed as not applicable on Figure 1 because the CSM is provided on DMA QAPP Worksheet #10, instead of as a standalone attachment to the document. We apologize for the confusion.

The request in Comment 36 specifically asks about the decision rule from the DMA.

Within the DMA Data Summary Report (DMA DSR), a clear decision is one where both the mean and the upper confidence limit for a DU are both above, or both below, the screening level for that metal. This is spelled out in Section 5.1.3, "The tables also include a column that shows whether the mean and UCL provide a clear decision – that is, they are either both above or both below the DMA screening level (SL)."

Section 6.5.2 of the DMA DSR discusses decision error specifically, identifying acceptable rates on decision errors (5% false negatives and 20% false positives) and giving the calculated rates of potential decision errors based on the actual DMA data (effective false positive rates were below 5%, and effective false negative rates were below 2%).

The final request in Comment 36 asks the EPA to describe how lead from the smelter can be distinguished from lead which originated in lead-based paint.

Dust and soil testing to determine the site-specific geospeciation and mineralogy of arsenic (As) and lead (Pb) was performed to assess the provenance of elevated lead and arsenic concentrations found in residential properties near the former Colorado Smelter Site (Site). Fifteen indoor dust samples, three waste pile samples, and thirty-two soil samples were selected for geospeciation testing. Examination of the mineral forms of As and Pb in the samples was performed by Dr. John Drexler at the Laboratory for Environmental and Geological Studies (LEGS), University of Colorado at Boulder and the results are compiled by PWT in a 2017 technical memorandum titled, Geospeciation Technical Memorandum. Dust and soil samples were selected to represent the range of As and Pb concentrations and provide a spatially representative group of samples for the OU1 residential community.

Analysis of the three waste pile samples indicates that 76% of the material is slag, which is an amorphous solid derived from a molten phase containing abundant metal oxides which are non-mineralic. However, important inclusions in the slag are the minerals galena (PbS), cerrusite ($PbCO_3$) and anglesite ($PbSO_4$) These mineral phases are expected to be in the slag because the ore that was processed by the Colorado Smelter was from the Monarch Mining District which mined carbonate replacement ore bodies rich in cerrusite, galena and anglesite along with other minerals. Of the 32 soil samples analyzed, thirteen contained anglesite, seventeen contained cerrusite, seven contained galena and seventeen contained slag particles. Of the fifteen dust samples analyzed, three samples contained anglesite, fourteen contained cerrusite, three contained galena and two contained slag particles. The occurrence of primary ore minerals known to be processed by the former smelter and found in the byproduct slag material, and which are identical to minerals identified in the soil and dust geospeciation analyses, combined with the presence of slag particles found in some of these samples, provides a fingerprint supporting the conclusion of a smelter contribution to the contamination present in the residential neighborhood. The geospeciation methodology and heterogeneous nature of the samples tested does not lend itself to setting confidence limits on the evaluation.

COMMENT 37 - Study area boundaries

The study boundaries were defined (Step 4) as follows:

The study area consists of neighborhoods located within 1-mile of the site and surface waters within 15 miles downstream of the Probable Point of Entry (PPE) of the site. Within the 1-mile radius the study area primarily includes residences to the southeast of the site in the direction of prevailing winds. Background soil will be collected from an area not likely to be impacted by the smelters that historically operated in Pueblo.

REQUEST: The study area does not appear to include residences to the southeast of the site and in the direction of prevailing winds. Please identify the number of homes that are actually upwind and downwind of the smelter site and are within the current study boundaries. This request is made because the majority of the study area residence locations in the defined study boundary are NOT down wind, based on the prevailing wind information.

I am requesting EPA to provide documentation to support the established boundary that is actually up-wind of the smelter locations and associated stacks, or points of potential release from the smelter operation.

Please identify the number of homes in the study area that are "upwind" and "down wind" of the smelter and provide analytical soil lead and soil arsenic data for each of the up wind and downwind categories.

Please compare the lead and arsenic soil concentrations up- and downwind of the smelter location to document that smelter emissions were a significant source of lead and arsenic..

Note that I could estimate the number pf homes up-wind and down-wind using the "accidently released" addresses for investigated homes, but the response period limitations does not allow me time to review and sufficiently perform this calculation and because to date I have respected EPA's request to not use those data, but if the above requests are not addressed by EPA, I will be forced to use the addresses (locations) to address the above issue. Of course, those data will be made available to EPA and the public.

<u>EPA Response:</u> *The technical rationale and decision-making which supported the initial site boundary are beyond the scope and detail of this Proposed Plan. However, the EPA did not establish the boundary arbitrarily. As described in the RI QAPP:*

"The 1/2-mile study area surrounding the main stack of the Colorado Smelter was based on the observation that "Major smelter deposits exist primarily within a 0.5 km radius of the stack, although some studies have found elevated soil-Pb concentrations as far away as 30 km, and drop to 200 mg/kg and below by distances of approximately 3-5 km (EPA, 2006b). Soil lead concentrations decrease dramatically with distance from the source, and depend greatly on wind speed and wind direction (EPA, 2006b). Boundaries will be adjusted based on establishing site-specific clean up levels from the HHRA and the results of the background study which will help to define natural and anthropogenic levels of metals in soils in the region. If metals concentrations near the perimeter of the study area are below health based bench marks, then the study area will not need to be increased. However, if metals concentrations near the perimeter of the study area are above health based bench marks, then additional data from the background study and geospeciation analysis will be considered to determine whether the study area should be increased."

Wind speed and wind direction are important parameters to consider when establishing a site boundary, so available wind rose data has been considered throughout the project. Reference 26 of the HRS listing package includes wind rose plots for the Pueblo Airport prepared by the Western Regional Climate Center for the periods from 1942 to 1969, 1970 to 1989, and 1990 to 2012. Additional wind rose plots from the Rocky Mountain Steel Mill for the time period from 2003 to 2005 and from 2008 to 2009 were also included as Reference 46 associated with the HRS listing package.

It is noteworthy that the predominant wind direction in the vicinity of the site has shifted dramatically in the last 75 years. As a result, homes in the West, Northwest, North, East and Southeast portions of the study area are all known to have been in the predominant downwind direction for some length of time. These changes in wind patterns, as well as the current climate conditions at the site were considered when establishing the site boundary. Because wind direction varies in all directions at times, it is impossible to rule out specific directions. Data collected may in the future be used to contract or expand the study area in certain directions as supported by the data.

The request is noted, however, EPA is not electing to perform additional analysis of the site boundary at this time.

COMMENT 38 - TAL metals

I am I am confused about the "TAL" metals EPA analyzed (and did not analyze) at the Colorado Smelter Site.

I was under the impression that Target Analyte Metals (TALs) were always analyzed in the early stages of a Superfund investigation.

There are 23 TAL METALS; Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, Zn

The 5 TAL metals in Red were not analyzed (or perhaps not reported) for Slag.

Metals analyzed and reported, but were not TAL metals include:

Au, Mo, Pd, Sr, Y, U, Zr, Ti, Th, Te, S, Rb, and Cs.

REQUEST: Please explain the rationale for not analyzing all TAL metals and identify the decisions (and rationale) that are support analyzing the reported non-TAL metals.

I believe this information should also be included a revised QAPP.

EPA Response: *The DMA QAPP identifies TAL metals only for those samples to be analyzed by the CLP laboratory and does not refer to samples run by XRF. The 23 TAL metals that are referred to above include mercury which is done as a separate analysis. The EPA analyzed for mercury during the DMA, and initially for the RI, until there was sufficient data to eliminate it as an analyte of interest. This leaves 22 TAL metals. Under the EPA CLP contract ISM 01.3 which is referenced in the DMA QAPP (the QAPP that includes slag sampling), the standard CLP inorganic analyte list contains 16 analyses: As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, Sb, Se, Ag, Tl, V, and Zn. Metals identified in red in the comment above as not being analyzed are therefore not correct. EPA did analyze and report Be and Se in the laboratory analyses for soils and slag.*

What did not get reported were Ca, Al, K, Mg and Na. These five analytes are the fundamental components of all rock forming minerals and therefore the major component of typical soils. As a result, these analytes were not requested to be reported as they are not elements directly associated with mining and smelting and would not be necessary to support the Data Quality Objectives for the DMA project. Attachment F to Figure 1 in the DMA QAPP states, "Historical data review did allow the site investigation and risk screening program to focus on selected constituents and support streamlining of the sampling and analytical program, eliminating several categories of contaminants to focus on smelter related metals. In accordance with Figure 1, the analytical results from soil samples previously collected at the Colorado Smelter Site may be used to assist the DMA." The five analytes not reported were determined to provide no value in assessing smelter related contamination.

The comment also requests the decisions or rationale for the Non-TAL metals that were analyzed. Neither the DMA QAPP or the RI QAPP indicate that non-TAL metals would be analyzed. Therefore, *these analyses were not conducted as part of the CLP analysis. These analytes are reported in the DMA DSR in Appendix D which contains the raw data output from the XRF instruments. However, the data in this appendix are not used for decision making in the DMA DSR (including the Pb and As results which require correction factors applied) because they have not received QA/QC and are only provided as a part of the project record. EPA apologizes for any confusion this information may have caused to review of the report.*

COMMENT 39

The study boundaries appear to be independent of specific site parameters and appear to have been set “arbitrarily. For example, the up-wind area homes in the defined study area include only older homes that would have had LBP, which would have been released to the soil.

ARR June, 22, 2011

“Each residential property was divided into between 1 and 4 multi incremental sampling units (or decision units) while road and background samples consisted of 1 multi-incremental sample/decision unit.”

(Comment: The initial ARR report provided data on “road or near-road” samples. The soil lead concentrations were in roadways and vacant lots, given to EPA in previous comments identified that these samples had significantly lower soil lead concentrations (average = 150 mg/Kg) than the residential yard soil.)

REQUEST: Please explain how vacant yards and street areas, which were in the near-by neighborhood, could have such low soil lead values. Note that these vacant areas did not have structures or potential LBP.

<u>EPA Response:</u> *The comment refers to a possible trend observed in data from the CDPHE Analytical Results Report. This CDPHE sampling effort and the resulting data are not within the scope of the Proposed Plan, and are not topics the EPA can respond to. However, to the extent possible, the EPA will attempt to respond to the specific request – that is, to explain how samples in vacant lots and near roadways, away from structures, might have lower concentrations of soil lead than samples collected in residential yards near structures.*

In a vacant lot or on the edge of a road, particulates from smelter stack emissions float through the air and fall over the ground, and can be assumed to be generally evenly distributed over the area. Contrast this with what happens in a residential yard where there is a house. Stack emissions float through the air and fall onto the property, but in this case, they are evenly distributed over the roof area and the yard. Later, precipitation will fall on the roof, carrying particulates from the stack emissions to the drip line, or to gutters, where the contamination is concentrated by runoff over time. For this reason, the conceptual model of contamination from an aerial point source is not inconsistent with the pattern described by the commenter.

COMMENT 40

ARR June, 2211, States on “P7.

“5.0 DATA QUALITY OBJECTIVES FOR SAMPLING

5.1 DATA QUALITY OBJECTIVES

The EPA Data Quality Objectives (DQO) Process is a seven-step systematic planning approach to develop acceptance or performance criteria for EPA-funded projects. Based upon the potential risks associated with the potential hazardous substances, the project team identified high metals concentrations in residential soils near the Colorado Smelter in Pueblo, Colorado, to be the main source of exposure."

REQUEST: EPA: Please provide actual data that support the above statement. Based on the available reports, it appears that EPA simply assumed the smelter was the source of lead in area soil and does not even discuss LBP as a potential source.

REQUEST: EPA please respond: Note that on p. 22 of the June 22, 2011 ARR it is stated that all the DQOs have been met (How is this possible when they were not defined in the QAPP?)

EPA Response: *The comment refers to the 2011 CDPHE Analytical Results Report. Sampling, decision making, and project planning conducted by state and local agencies are not within the scope of the Proposed Plan, and are not topics the EPA can respond to. However, to the extent possible, the EPA can discuss the how the smelter as a source of lead in soil is supported by site data.*

Dust and soil testing to determine the site-specific geospeciation and mineralogy of arsenic (As) and lead (Pb) was performed to assess the provenance of elevated lead and arsenic concentrations found in residential properties near the former Colorado Smelter Site (Site). Fifteen indoor dust samples, three waste pile samples, and thirty-two soil samples were selected for geospeciation testing. Examination of the mineral forms of As and Pb in the samples was performed by Dr. John Drexler at the Laboratory for Environmental and Geological Studies (LEGS), University of Colorado at Boulder and the results are compiled by PWT in a 2017 technical memorandum titled, Geospeciation Technical Memorandum. Dust and soil samples were selected to represent the range of As and Pb concentrations and provide a spatially representative group of samples for the OU1 residential community.

Analysis of the three waste pile samples indicates that 76% of the material is slag, which is an amorphous solid derived from a molten phase containing abundant metal oxides which are non-mineralic. However, important inclusions in the slag are the minerals galena (PbS), cerrusite ($PbCO_3$) and anglesite ($PbSO_4$) These mineral phases are expected to be in the slag because the ore that was processed by the Colorado Smelter was from the Monarch Mining District which mined carbonate replacement ore bodies rich in cerrusite, galena and anglesite along with other minerals. Of the 32 soil samples analyzed, thirteen contained anglesite, seventeen contained cerrusite, seven contained galena and seventeen contained slag particles. Of the fifteen dust samples analyzed, three samples contained anglesite, fourteen contained cerrusite, three contained galena and two contained slag particles. The occurrence of primary ore minerals known to be processed by the former smelter and found in the byproduct slag material, and which are identical to minerals identified in the soil and dust geospeciation analyses, combined with the presence of slag particles found in some of these samples, provides a fingerprint supporting the conclusion of a smelter contribution to the contamination present in the residential neighborhood.

COMMENT 41

P8 of 101 Federal Uniform Policy QAPP for Smelter states:

"Data collected in the DMA was used to update the preliminary CSM and refine it before continuing the Site RI. The data collected during the RI will be used to refine the preliminary CSM to a baseline CSM."

REQUEST: Please provide a copy of the refined CSM that was developed prior to continuing to the Site RI, as cited above in the QAPP. Also, please provide a copy of the revised QAPP, it is impossible to make meaningful comments when so many documents have been withheld by EPA. I am confident that EPA has developed a "refined CSM" and a QAPP, but that information has not been made available to the public.

EPA Response: *As noted in the comment, the conceptual site model (CSM) for the Colorado Smelter Site is not a standalone document, but rather is included in the Remedial Investigation Quality Assurance Project Plan (RI QAPP). The revised CSM was provided directly to the commenter with the revised QAPP (as noted in the comment above), and the most up to date RI QAPP, revision 3, is also available online at https://semspub.epa.gov/work/08/1884190.pdf.*

COMMENT 42

The report, P22. 1.1 FIELD QUALITY CONTROL PROCEDURES, states that the DQOs have been met. All Technical Standard Operating Procedures (TSOPs) for field activities as specified in the approved SAP58 were followed thus maintaining representativeness and comparability in the data set. The DQOs for this project have been met and the data collected are of sufficient quality to answer the site investigation questions. I

RESPONSE: ln response to this comment, please refer to comment 21, which identifies issues with the DQO Process. It is apparent that it was not performed according to guidance and requires a complete rewrite. That comment makes it is obvious that the DQO Process has not been performed according to EPA guidance and therefore, it is impossible to state that the DQOs were met.

The PARCC parameters actually evaluate data quality, but do not address the use of the data.

EPA Response: *The comment refers to the 2011 CDPHE Analytical Results Report. Sampling, decision making, and project planning conducted by state and local agencies are not within the scope of the Proposed Plan, and are not topics the EPA can respond to. However, the DQO process has been followed and documented for EPA RI sampling, and has been provided previously in these comment responses.*

COMMENT 43

This section of the report “11.4 DATA USABILITY SUMMARY” simply does not follow EPA guidance. The section states: ‘The data quality indicators (PARCC parameters) of precision, accuracy, representativeness, completeness, comparability and sensitivity were evaluated. All data is usable as qualified.” Note that the PARCC parameters identify the quality of data but not the usability.

However, EPA has Data Quality Assessment Guidance that should be used.

P8. Sample results from this study were used to develop decision rules, define tolerance limits on decision errors, and optimize the sampling design…..

REQUEST: EPA please provide copies of the decision rules in the QAPP. I cannot locate a decision rule as defined in EPA DQO guidance.

Judgmental sampling was used to bias samples toward more potentially contaminated areas. Statistical sampling was not used and a tolerance limit on decision errors was not calculated. For soil and source sampling, multi-increment samples were collected to more accurately reflect the average concentration of the sampling zone or decision unit.”

Residential yards with homes were divided into between 1 and 4 zones or decision units such as front yard, back yard, and side yards. The general format used for labeling zones is shown in Figure 2. In each zone 5 individual aliquots were collected. Five individual samples were collected for each right-of-way, background and source sample.

P30. “The use of multi-incremental sampling ensures that the data is representative of actual site conditions, and that the decision unit was constructed appropriately. Excessive variability within a decision unit could indicate the decision unit is too large.

True, but only when the 30-point sampling is performed as written in the QAPP. It is not true when it is performed as actually occurred at the site using judgmental sampling.

EPA Response: *The comment appears to refer to the 2011 CDPHE Analytical Results Report. Sampling, decision-making, and project planning conducted by state and local agencies are not within the scope of the Proposed Plan, and are not topics the EPA can respond to.*

However, to the extent possible, EPA will attempt to address what appear to be the underlying concerns expressed in the comment, 1) a request for the decision rule from the QAPP, and 2) a concern that judgmental sampling might have been used to characterize average soil concentrations in residential yards at the Colorado Smelter Site.

Within the DMA Data Summary Report (DMA DSR), a clear decision is one where both the mean and the upper confidence limit for a DU are both above, or both below, the screening level for that metal. This is spelled out in Section 5.1.3 "The tables also include a column that shows whether the mean and UCL provide a clear decision – that is, they are either both above or both below the DMA screening level (SL)."

Section 6.5.2 of the DMA DSR discusses decision error specifically, identifying acceptable rates on decision errors (5% false negatives and 20% false positives) and giving the calculated rates of potential decision errors based on the actual DMA data (effective false positive rates were below 5%, and effective false negative rates were below 2%).

As described in the DMA QAPP and in the RI QAPP, yards within the EPA study area are being sampled individually on a decision unit (DU) basis. The determination or assignment of DUs is based on natural divisions within each specific yard such as front yard, back yard, drip zone, play area, etc. When sample aliquots are collected, no attempt is made by the field team leader to select a location within a DU which is more likely to contain contamination. Therefore, this is not a judgmental sampling approach. Instead, per the SOP, the field team selects locations in order to get the correct number of aliquots and generally cover the entire physical area of the DU. Therefore, it is appropriate to use these sample results to characterize an entire DU, whether the DU is a small drip zone, or the outfield of a ball park.

In contrast to the approach used at Colorado Smelter, a hypothetical judgmental residential yard sampling approach might be to select aliquot locations within an apron where slag had been observed on the ground surface to identify the highest concentrations expected to be found in that yard. If this approach had been taken, it would not be appropriate to use those apron sample concentrations to extrapolate to the entire yard.

Hopefully this explanation is helpful in clarifying the commenter's concern that judgmental sampling was being applied inappropriately to this site. The EPA concurs that a judgmental approach to sampling would not be appropriate for characterizing overall concentrations within a yard, nor would it be appropriate to take sample results from a few yards nearest the historical smelter and extrapolate the results to the entire study area.

The question of whether 5 increments or 30 increments are necessary to adequately characterize a DU, providing a clear decision (both the mean concentration and the upper confidence limit on the mean above, or below, the applicable screening level or project remediation goal), with less than 5 percent false negatives and less than 20 percent false positives is addressed fully in the DMA DSR.

ATTACHMENTS

1. My Resume and Experience.
2. Average residential soil lead concentration vs Distance from the primary stack at the refinery
3. Examples of Slag Piles left in place at the Leadville Colorado Superfund Site
4. The Wilcoxon Rank Sum Results for Arsenic Background and Site data.
5. Graphic relationships between As and Pb in site soil.
6. Off-set maps of individual lead and arsenic concentrations provided at CAG meetings

REFERENCES

1. Forged Together in the Bessemer Neighborhood,
2. Environmental Geochemistry and Health (2006) 28:297–315 Springer 2006 DOI 10.1007/s10653-005-9000-6. (This publications is available on line. It contains arsenic soil lead concentrations across Pueblo, which were used in the Wilcoxon Rank Sum analysis.
3. Crown, 1968. This reference provides many examples of metals in OLDER house paints.
4. Relation Between Housing Age, Housing Value, and Childhood Blood Lead Levels in Children in Jefferson County, Ky. Dennis Y. Kim, MD, MPH, Forrest Staley, MUP,Gerald Curtis,BS,and Sharunda Buchanan, PhD

ATTACHMENTS

Attachment A: Coomes Resume

Attachment B: Figure showing weighted average residential soil lead and arsenic concentration vs Distance from the primary stack at the smelter.

(The spread sheet containing the data use is available on request.)

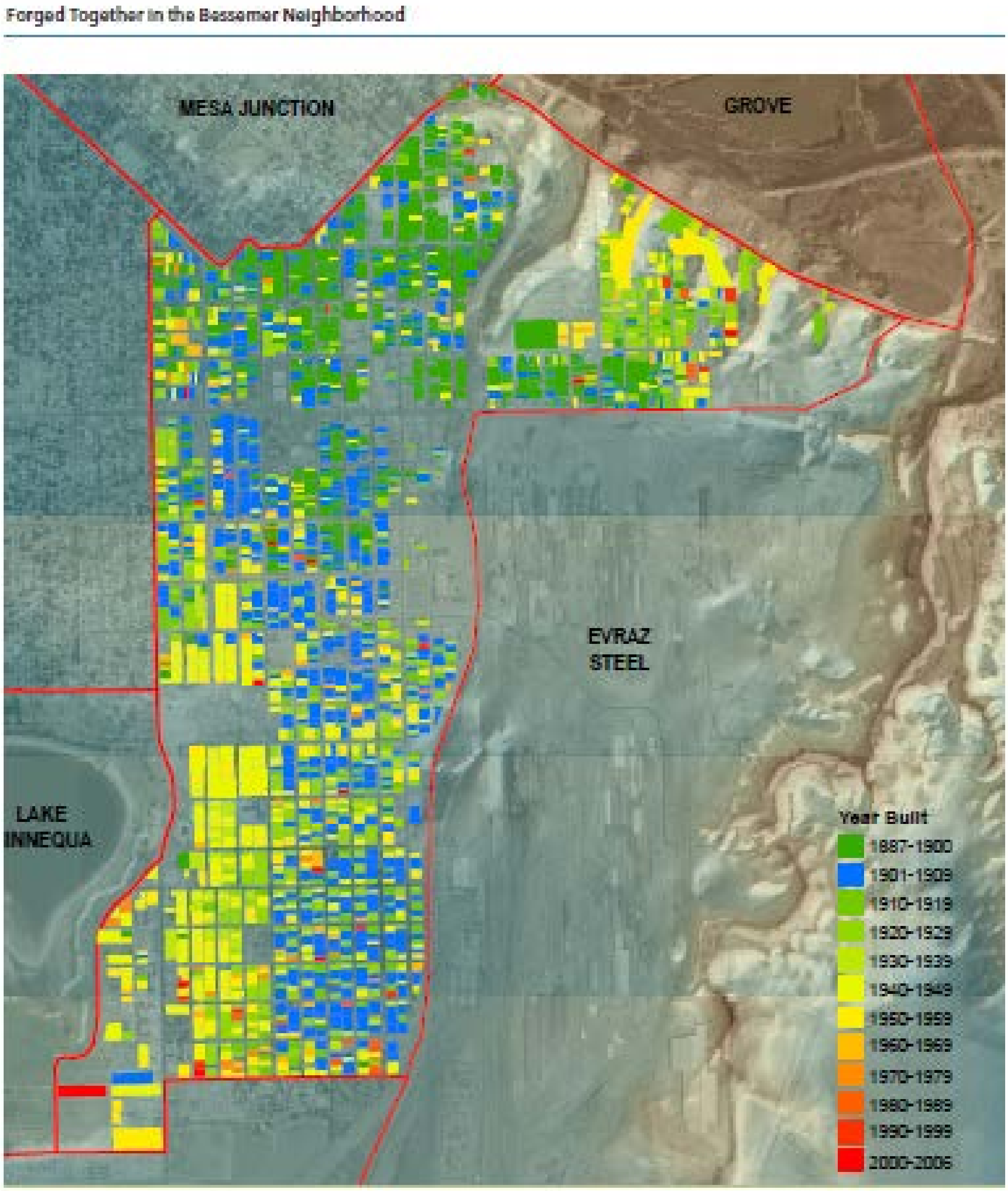
Attachment C:

Letter from EPA stating that Coomes was not correct. This letter was sent to each member of the Pueblo City Council where I had made public statements about how EPA was not following their guidance.

Attachment D: Excel spread sheet – results of the Wilcoxon Rank Sum Comparison of on-site and off-site arsenic concentrations. The off-site concentrations were taken from: “Environmental Geochemistry and Health (2006) 28:297–315 Springer 2006 DOI 10.1007/s10653-005-9000-6” (the Diawara Study) (On site arsenic concentrations were taken from the ARR

Attachment E: Age of homes in the investigation area, taken from Reference 1,

Attachment F: Wind rows provided in the 2008 Preliminary Assessment.



Attachment E: Map showing the age of homes in the Study area.

Attachment F: Figure 4-3: Geometric Means (lead in soil) for Foundation and Open Samples Reported in the Minnesota Soil Lead Study. Included on page XX

Attachment G: EPA's letter to Pueblo City council rejecting M. Coomes' Wilcoxon Rank Sum analysis of Diawara's data and the DMA data.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION S
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1AU6 3 1 2012

Ref: 8EPR-AR

Chris Kaufman, President Pueblo City Council
200 South Main Street Pueblo, CO 81003

Dear Mr. Kaufman:

The U.S. Environmental Protection Agency (EPA) appreciates and welcomes the ongoing discussion about the Eilers neighborhood and the former Colorado Smelter site.
We do however believe it is appropriate to clarify the understanding of the data collected to date and how EPA assesses these data for purposes of listing a site on the National Priorities List (NPL). This letter is intended to respond specifically to certain statements made by Merril Coomes at a City Council meeting (Monday, 6/25/12) and in a letter to the Pueblo Chieftain (Sunday, 8/12/12) that contain several inaccuracies. The EPA is committed to assuring that factual information is available to all interested stakeholders and that this information is the basis for decision making.

Mr. Coomes' assertion that arsenic concentrations identified in Eilers area samples are identical to those characterized during the 2006 "Pueblo-wide" soil study is simply not correct. EPA technical staff including Charles Partridge, PhD, EPA toxicologist, and Robert Edgar, PhD, EPA statistician, reviewed the data from the 2006 Colorado State University-Pueblo (CSU-Pueblo) - "Pueblo-wide" soil study and compared it to the data collected in the Eilers neighborhood in support of listing the Colorado Smelter site. Based on rigorous analysis using ***five*** *different statistical tests,* EPA determined that the soil arsenic data collected from the Eilers neighborhood are indeed statistically significantly higher when compared to the soil arsenic data from the 2006 CSU-Pueblo study.

The following figure shows a comparison of the levels of arsenic in the soil from the 2006 CSU Pueblo study versus the levels of arsenic found in the soils of the Eilers neighborhood. On the vertical axis are the numbers of samples at those concentrations. You can see that the average concentration of 12.4 milligrams per kilogram (mg/kg) for the CSU-Pueblo samples is much lower than the EPA/CDPHE study's average concentration of 55.4 mg/kg samples. Additionally all 66 of the CSU-Pueblo samples contained less than 70 mg/kg arsenic and approximately 92 percent of the CSU-Pueblo samples contained 20 mg/kg or less of arsenic. None of the CSU Pueblo samples contained greater than 70 mg/kg of arsenic; whereas there were samples with arsenic concentrations exceeding 70 mg/kg and as high as 210 mg/kg in the EPA/CDPHE study's samples. This figure dramatically illustrates the increased levels of arsenic in the soils surrounding

COMMENT 44 - IS SOIL REPLACEMENT A PROVEN OPTION AND PERMANENT SOLUTION?

EPA's1986 Study Tri City Study (Baltimore, Cincinnati, and Boston) was designed to determine the effects of soil lead remediation on child BLLs. It was a $10 TO $15 MM effort. EPA did not approve of the researchers original conclusions, and the report went through several revisions to meet EPA's approval. The original conclusions include: Soil lead remediation: did not permanently reduce child BLLs, interior dust levels were not permanently reduced, and the outdoor soil became re-contaminated within one year. EPA R 8 does not consider these study results, which indicate soil replacement is a temporary (one-year solution) in their proposed interim remedial action.

REQUEST: I request that EPA R8 review the EPA Tri-City Study and make it available to the CAG for review. Also, I'm confident that EPA R8 can obtain all early draft versions and revisions of that particular study, including data summaries. When you do, please provide electronic copies and explain why my discussion/conclusion is not correct that soil remediation did not permanently reduce or impact child BLLs

<u>EPA Response:</u> *Both draft and final versions of the 1986 Tri City Study mentioned are outside the scope and detail of the Proposed Plan and supporting documents. Further, it is not clear that a study conducted some 30 years ago in the Northeast, with specific data quality objectives unrelated to this project, and without consideration of the geology or land use history of the Pueblo area, is relevant to the Proposed Plan at Colorado Smelter Site.*

COMMENT 45 - SLAG AS A SOURCE MATERIAL

EPA contends that the slag piles are a source of particulate emissions which potentially expose nearby residents.

At many sites I have been involved, EPA identifies unusual or "different" appearing material as a potential source material. There are large piles of slag that are associated with the Colorado Smelter. They are black piles, very visible and do not blend into the visual environment. Most lead refinery slag has been used to as base material for railroad tracks or highways. Slag is used commercially in construction.

It has been spread very widely in the environment. At the Leadville Colorado Superfund site one slag pile was removed at the request of citizens. A conversation with the Leadville County commissioners indicates they do not know where the slag was taken, but suspect is was given or sold to a road construction business or other commercial firm (unconfirmed). Slag is perfect for this use, because it very dense and supports heavy loads.

<u>EPA Response:</u> *Due to the size of the slag piles, the particulate size distribution of the slag, and the proximity of the piles to residences, it is likely that the slag piles at the Colorado Smelter Site contribute some amount of windblown emissions that could expose nearby residents. Preliminary computer-based modeling using AERSCREEN has shown that windblown contamination may be of concern. Therefore, EPA will be assessing this potential route of exposure as part of the RI, and may revise the CSM based on the outcome of this assessment. Please note that windblown contamination is expected to be a minor pathway for a limited number of homes. The main route of exposure has been demonstrated to be historic deposition of airborne emissions from the smelter stack.*

COMMENT 46

Reference 4 relates housing age to measured BLLs. After reading that short reference, if I were to plan an EPA study that would be "guaranteed" EPA funding, I would select and area with older homes and some identifiable historic lead point source such as the Pueblo Smelter.

I feel that it is exactly what EPA R 8 has done in this situation. The data generated to date point to LBP as the source and not the closed Colorado Smelter.

The smelter site is surrounded with older homes see Attachment 3. This situation allows EPA to propose the site be listed (after panicking the residents about the potential risk to their children). Note that the measured BLLs (by the local Department of Health and Diawara's efforts have not been of concern compared to EPA's remediation goal, which is greater than 10 µg/dL. The levels referenced by EPA in Public meetings are actually only "reportable" under Colorado law, which states that all BLLs are reportable – regardless of the actual value.

EPA Response: *Source attribution was established in the HRS listing package and has been further substantiated by geospeciation studies that show that the lead and arsenic in the soils are predominantly from pyrometallurgical sources associated with smelting activity.*

COMMENT 47

EPA often states that the slag piles are a source of particulates that expose residents to lead and other metals and the piles require "remediation".

The Colorado Smelter Preliminary Assessment, April 18, 2008 p 6 states: Average wind speed is 7.7 miles per hour and predominatly flows from the west-northwest, although occasional upslope conditions cause a reversal in wind direction (WdbMET)."

REQUEST: I request EPA to provide documentation (obtained after the 1995 PA) that slag is a source of air particulate.

EPA Response**:** *EPA sieves all soil and dust samples to the 250 µm particle size. This size range has been demonstrated by numerous studies to be the size that most adheres to skin and leads to incidental ingestion. EPA has performed numerous geospeciation studies on this sub-250-µm size fraction for the Colorado Smelter Site. Analysis of geospeciation samples have shown that the source of these metals is predominantly pyrometallurgical and from smelting activity. Geospeciation data is presented in Appendix D of the Focused Feasibility Study.*

Photos of Slag Piles in Leadville Colorado

Photo of the "remediated" slag pile (s) in Leadville. EPA did not remove all of the slag, as shown in the following photograph. I conclude that slag was not considered a source material by EPA (as was described in an early Site report.

The "hills" in this photo are slag piles:

Typical slag pile left in place in Leadville:

Note the homes in the lower right of this photo only the roofs are visible, but they are very close to the slag pile. This was not of apparent concern for EPA R8.

COMMENT 48 - P6 of the 2008 PA States

“The Denver & Rio Grande railroad tracks, and possibly portions of Interstate 25, appear to have been constructed on the slag dump. There are numerous reports that smelter waste was used as ballast material for miles of railroad track in Colorado (CDPHE HMWMD 1995).

Pueblo historian Eleanor Fry recounted the history of the Colorado Smelter waste pile. According to her 1990 article in the Pueblo Lore, the "slag dumps of the old Eilers smelter were disappearing during the spring of 1927. Hundreds of carloads of slag were loaded and hauled to all parts of the West and Southwest to ballast railroad tracks. Trainloads also were being hauled to the Mississippi Valley to repair flood damage to railroad rights of way. The solid cliffs of slag were broken up by blasting and steam shovels loaded the loose material into the railroad cars. Twenty five to fifty cars were shipped out daily”.

ATSDR stated: “Ingestion of soil and inhalation of windblown soil are potential human exposure pathways of concern and may occur due to the extent of off-site contamination in surface soils (most likely from LBP) near the site (ATSDR 2006).” There was no mention of wind-blown slag.

Photo 1. The slag remaining after the EPA removal. It is clear, based on the remaining slag that EPA does not consider Slag as a potential hazard or source of release to the environment.

Slag was discussed in early reports at the Colorado Smelter Site state:

Section 5.3 of the 1991 Santa Fe Avenue Bridge Culvert Preliminary Report states:

> "This PA site (Slag piles) is not considered to pose any threat to human health of the environment via the air pathway. The slag heaps form very competent beds that do not permit the release of airborne dust."
>
> A more recent statement by EPA for **fine** slag states in the assessment of the site: The stockpiled fine slag at the Arkansas Valley smelter slag pile does not present an imminent or substantial endangerment to public health, welfare, or the environment.

Note that the cited early reports for this site do not identify slag as a source of air borne particulate or an ingestion hazard.

REQUEST: Please provide the EPA data and/or reports that identifies smelter slag as a particulate source for ingestion.

SLAG PILES IN LEADVILLE COLORADO

EPA removed 2 slag piles at the Leadville Superfund site. This was done because of public pressure to remove this “eyesore”. Below is a photo of the slag pile area after removal.

Photo of “Cleaned Slag Pile Leadville. As you can see, significant amounts of slag remain. EPA obviously did not consider Slag as a waste that releases air emissions.

<u>EPA Response:</u> *Smelter slag has been positively identified as a significant source of metals contamination to residential yards in the study area. Analysis of the three waste pile samples indicates that 76% of the material is slag, which is an amorphous solid derived from a molten phase containing abundant metal oxides which are non-mineralic. However, important inclusions in the slag are the minerals galena (PbS), cerrusite ($PbCO_3$) and anglesite ($PbSO_4$) These mineral phases are expected to be in the slag because the ore that was processed by the Colorado Smelter was from the Monarch Mining District which mined carbonate replacement ore bodies rich in cerrusite, galena and anglesite along with other minerals. Of the 32 soil samples analyzed, thirteen contained anglesite, seventeen contained cerrusite, seven contained galena and seventeen contained slag particles. Of the fifteen dust samples analyzed, three samples contained anglesite, fourteen contained cerrusite, three contained galena and two contained slag particles. The occurrence of primary ore minerals known to be processed by the former smelter and found in the byproduct slag material, and which are identical to minerals identified in the soil and dust geospeciation analyses, combined with the presence of slag particles found in some of these samples, provides a fingerprint supporting the conclusion of a smelter contribution to the contamination present in the residential neighborhood.*

APPENDIX
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Figure 1: Colorado Smelter OU1 Site Location

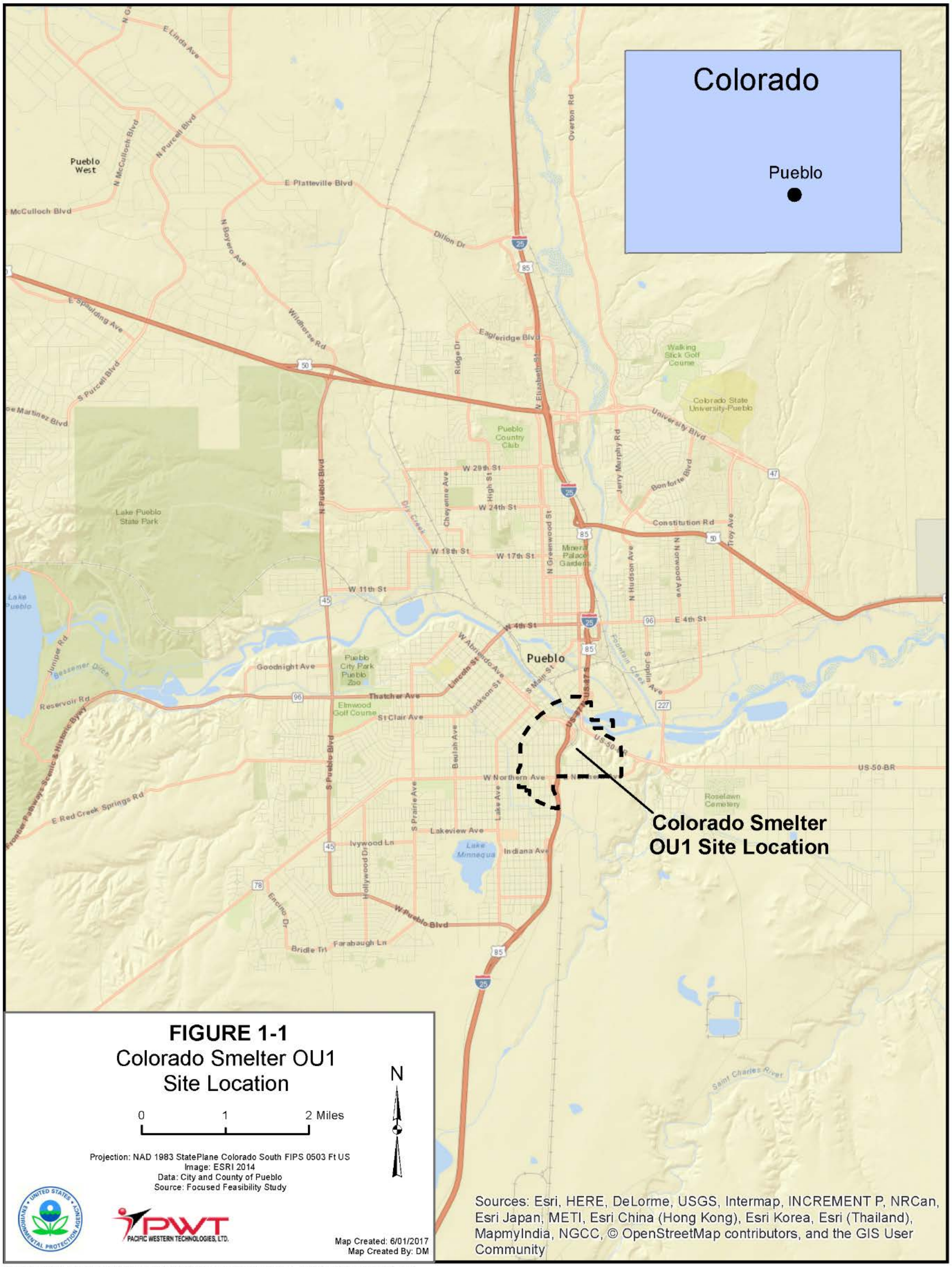

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Figure 2: Colorado Smelter Site Base Map and Study Area

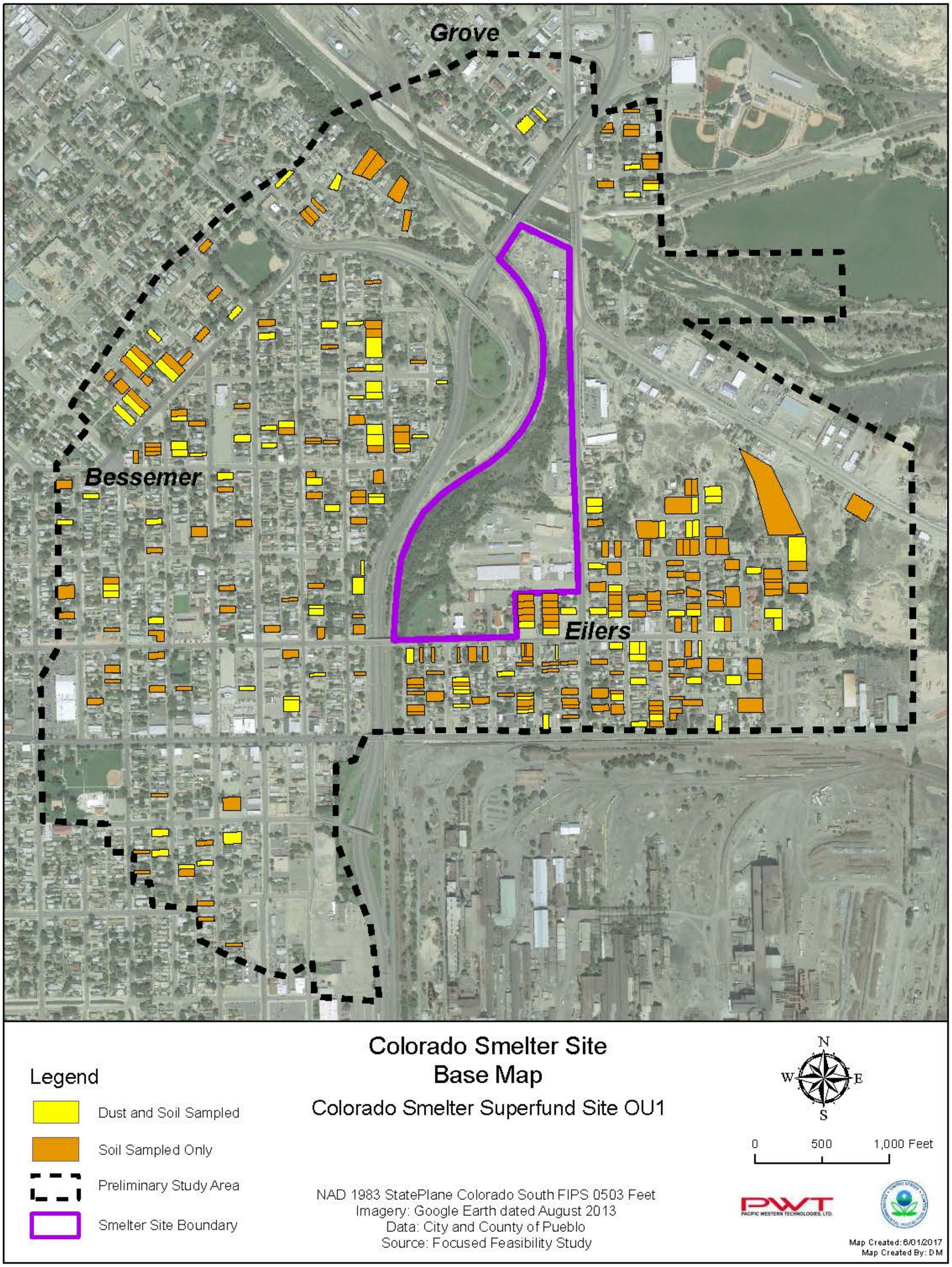


Figure 3: Conceptual Site Model Operable Unit 1, Pacific Western Technologies, June 2017

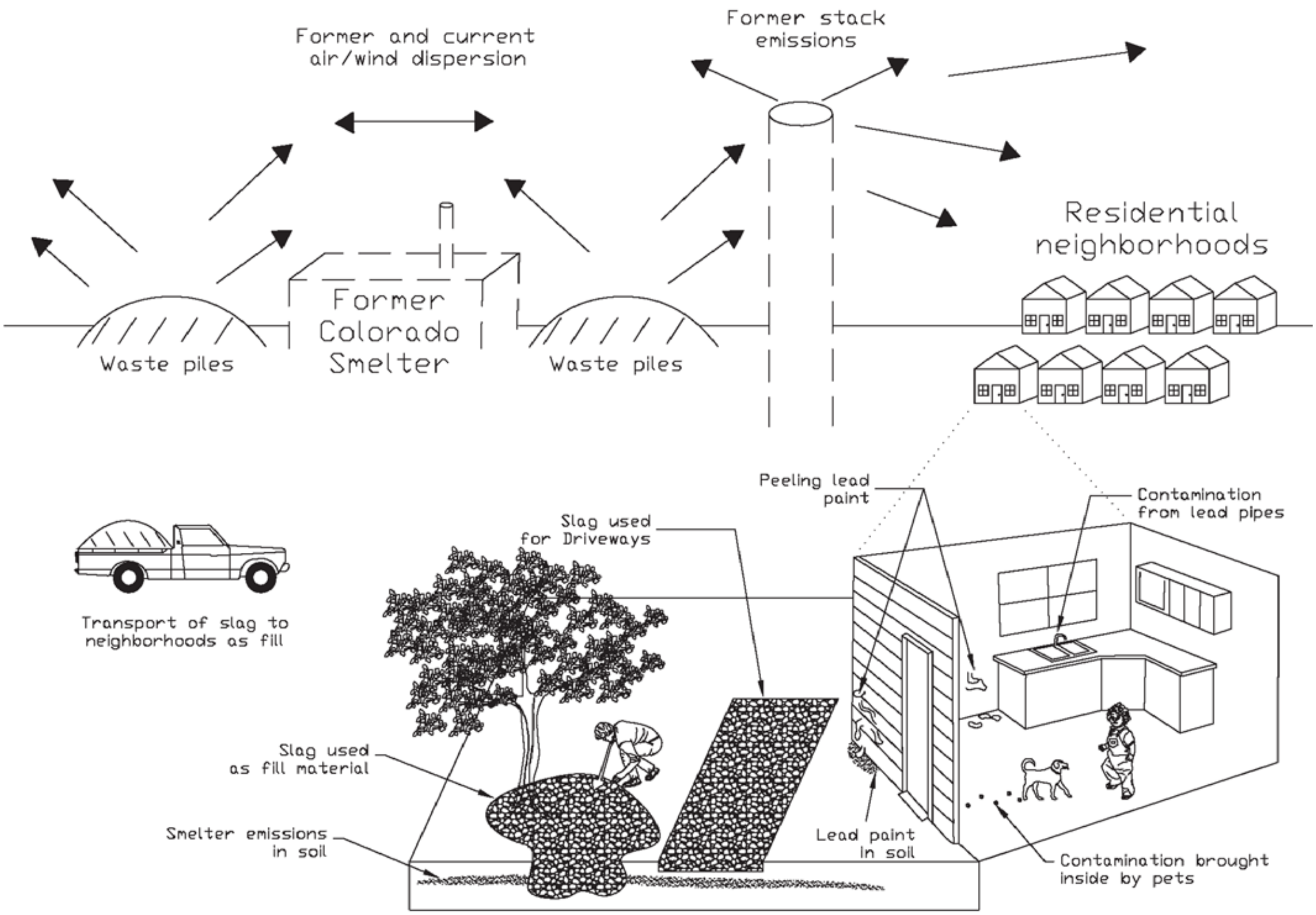
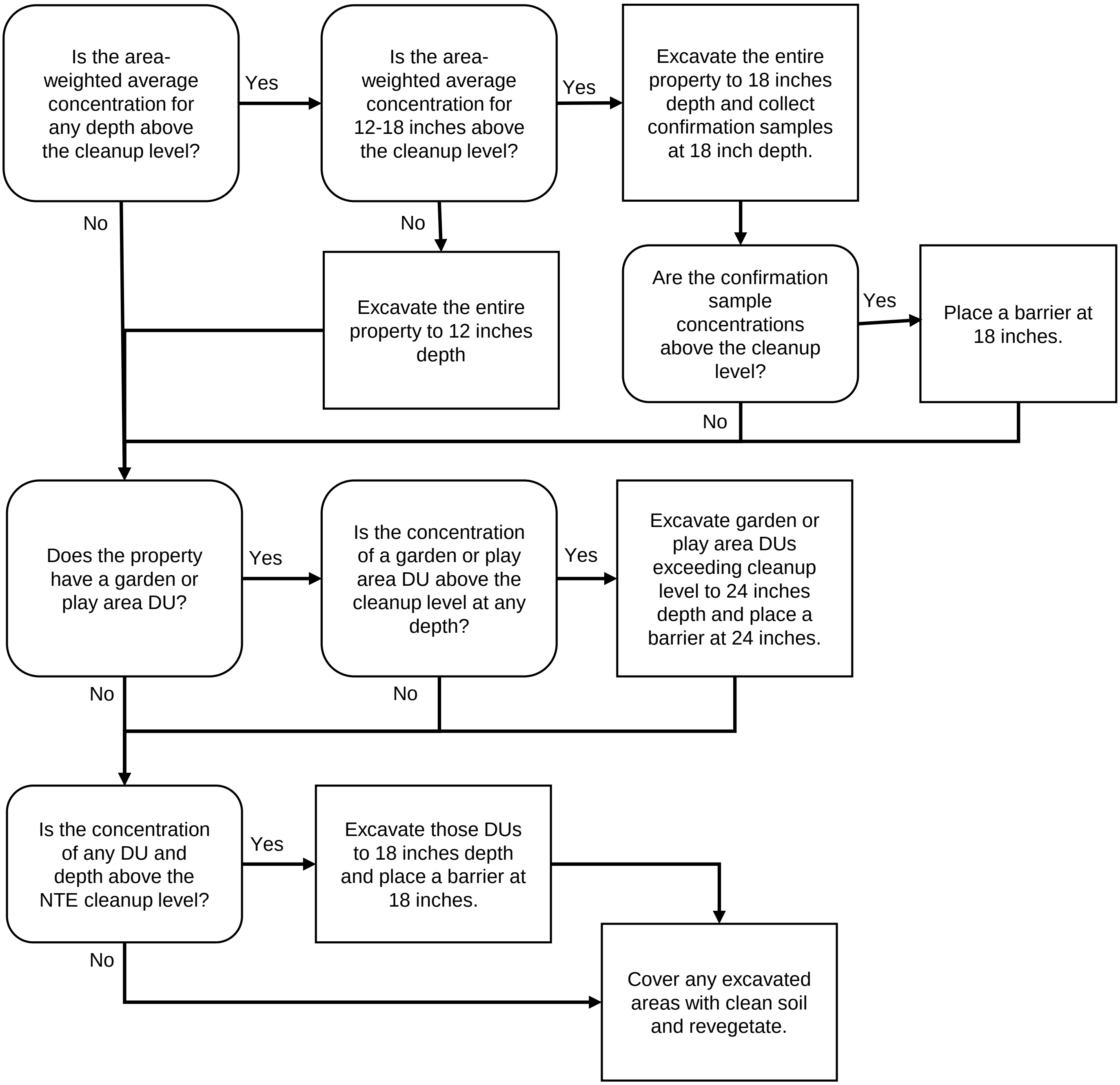


Figure 5: Alternative 3 – Soil Cleanup Flowchart



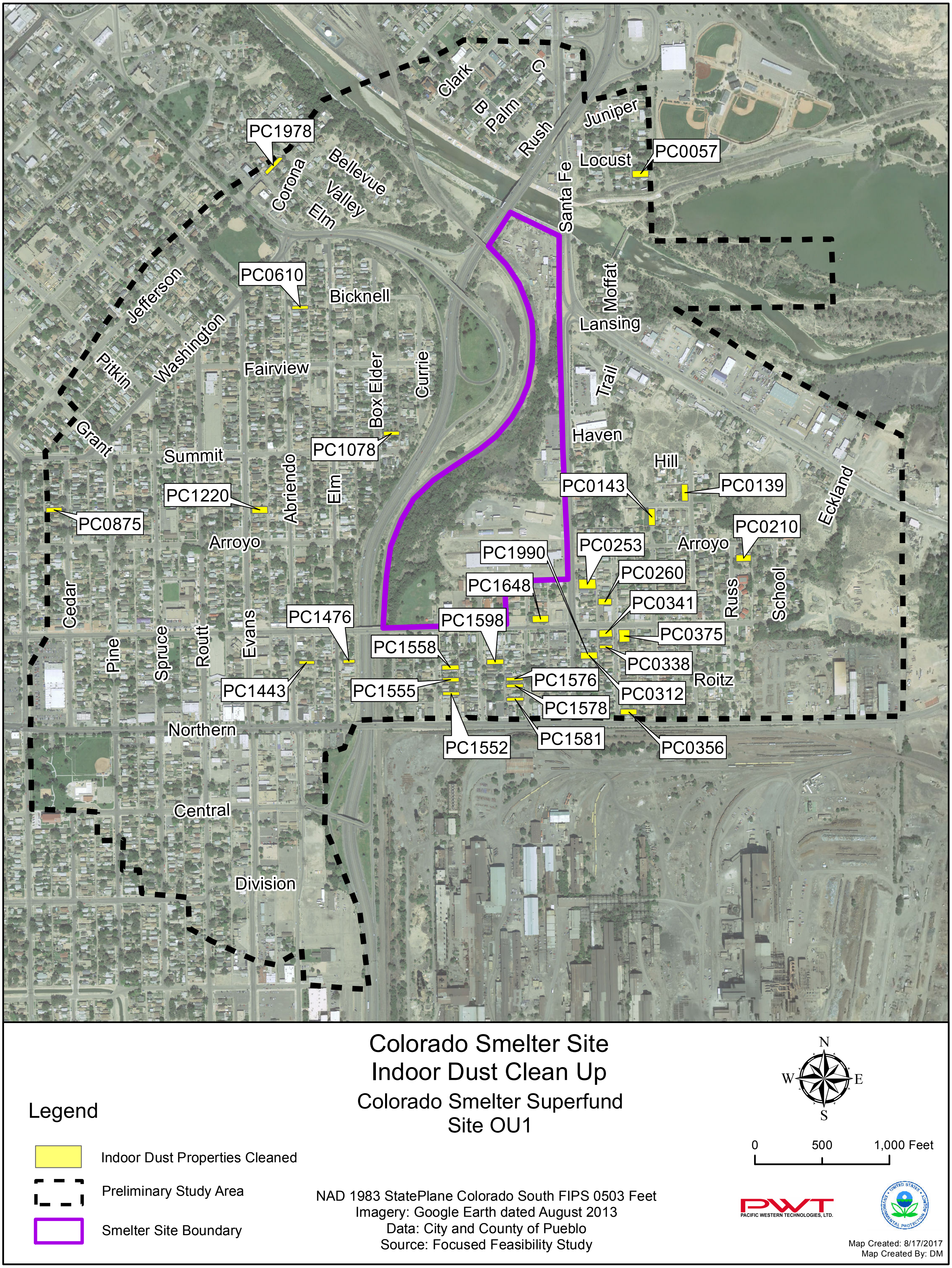
Equation for calculation of area-weighted average concentration:

$$C_{AA} = \frac{(C_{DU1} \times A_{DU1} + C_{DU2} \times A_{DU2} + \cdots + C_{DUn} \times A_{DUn})}{(A_{DU1} + A_{DU2} + \cdots + A_{DUn})}$$

Where

C_{AA} = the area-weighted average concentration for a property with n DUs
C_{DUX} = the concentration of the DU, where X is 1, 2, etc. up to n
A_{DUX} = the surface area of the DU, where X is 1, 2, etc. up to n

Figure 6: Colorado Smelter Site Indoor Dust Clean Up



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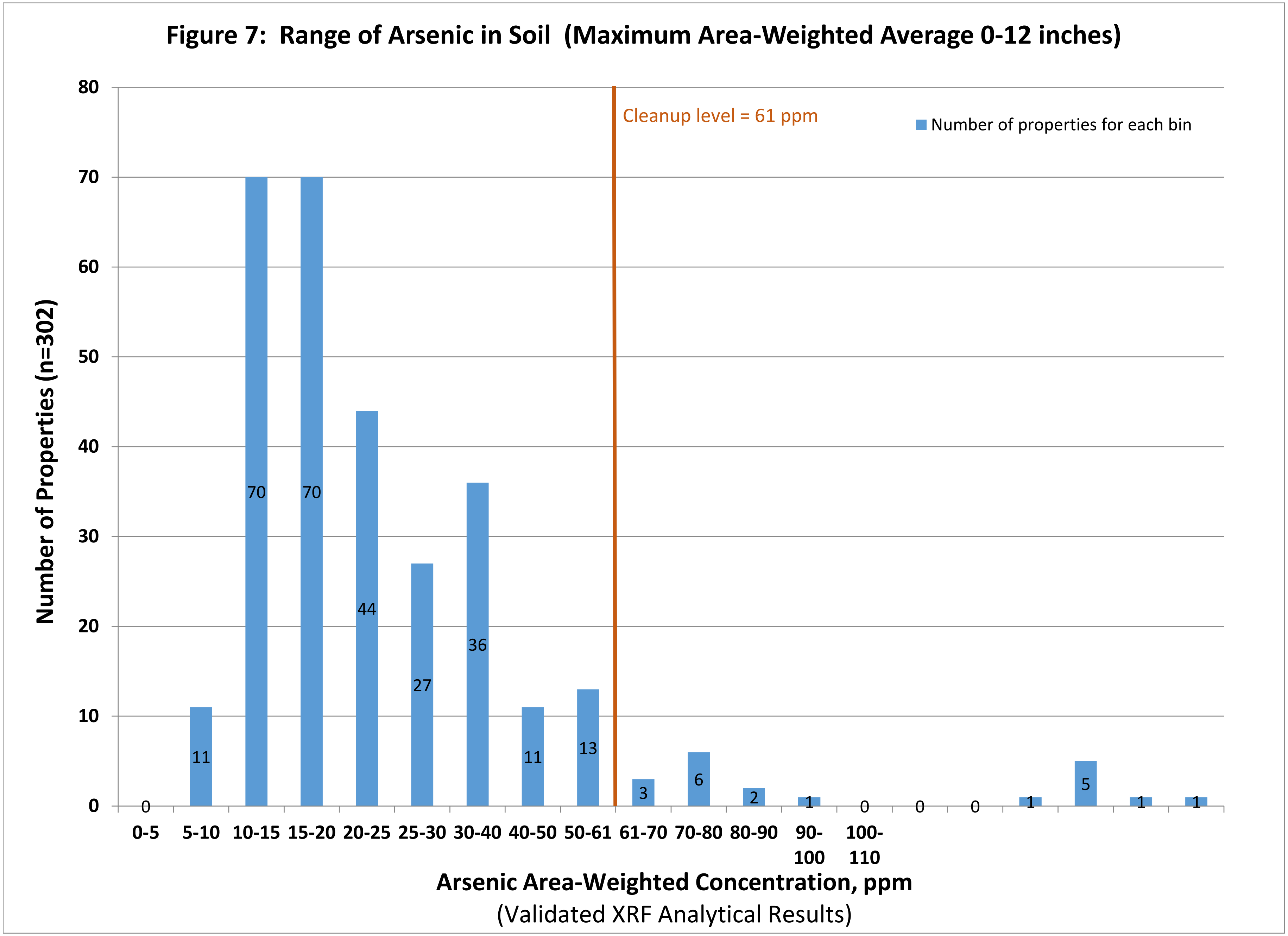
Figure 7: Range of Arsenic in Soil (Maximum Area-Weighted Average 0-12 inches)
Cleanup level = 61 ppm
Number of properties for each bin
Number of Properties (n=302)
0
10
20
30
40
50
60
70
80
0
11
70
70
44
27
36
11
13
3
6
2
1
0
0
0
1
5
1
1
0-5
5-10
10-15
15-20
20-25
25-30
30-40
40-50
50-61
61-70
70-80
80-90
90-100
100-110
Arsenic Area-Weighted Concentration, ppm
(Validated XRF Analytical Results)

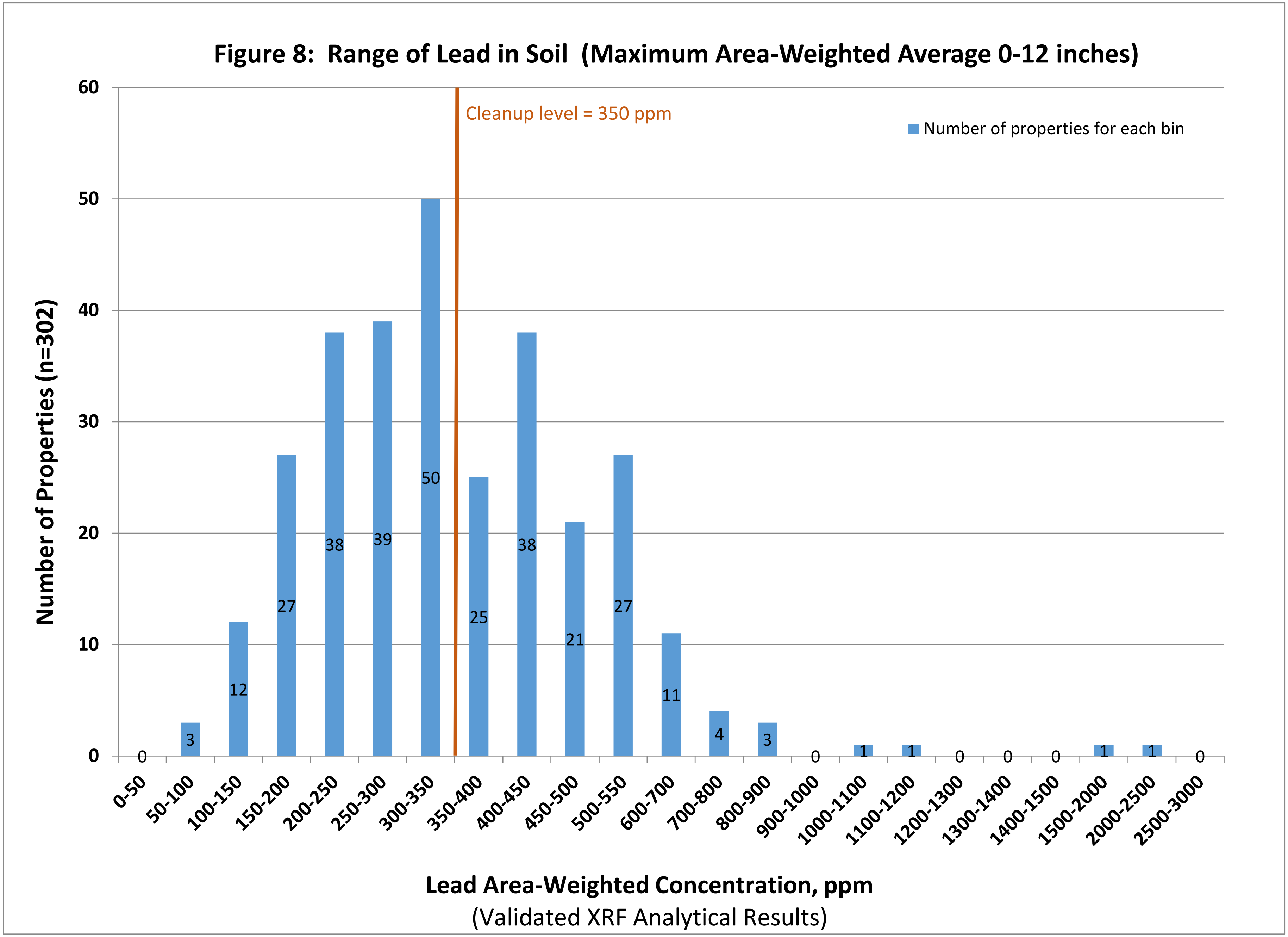

Figure 8: Range of Lead in Soil (Maximum Area-Weighted Average 0-12 inches)
Cleanup level = 350 ppm
Number of properties for each bin
Number of Properties (n=302)
60
50
40
30
20
10
0
0
3
12
27
38
39
50
25
38
21
27
11
4
3
0
1
1
0
0
0
1
1
0
0-50
50-100
100-150
150-200
200-250
250-300
300-350
350-400
400-450
450-500
500-550
600-700
700-800
800-900
900-1000
1000-1100
1100-1200
1200-1300
1300-1400
1400-1500
1500-2000
2000-2500
2500-3000
Lead Area-Weighted Concentration, ppm
(Validated XRF Analytical Results)

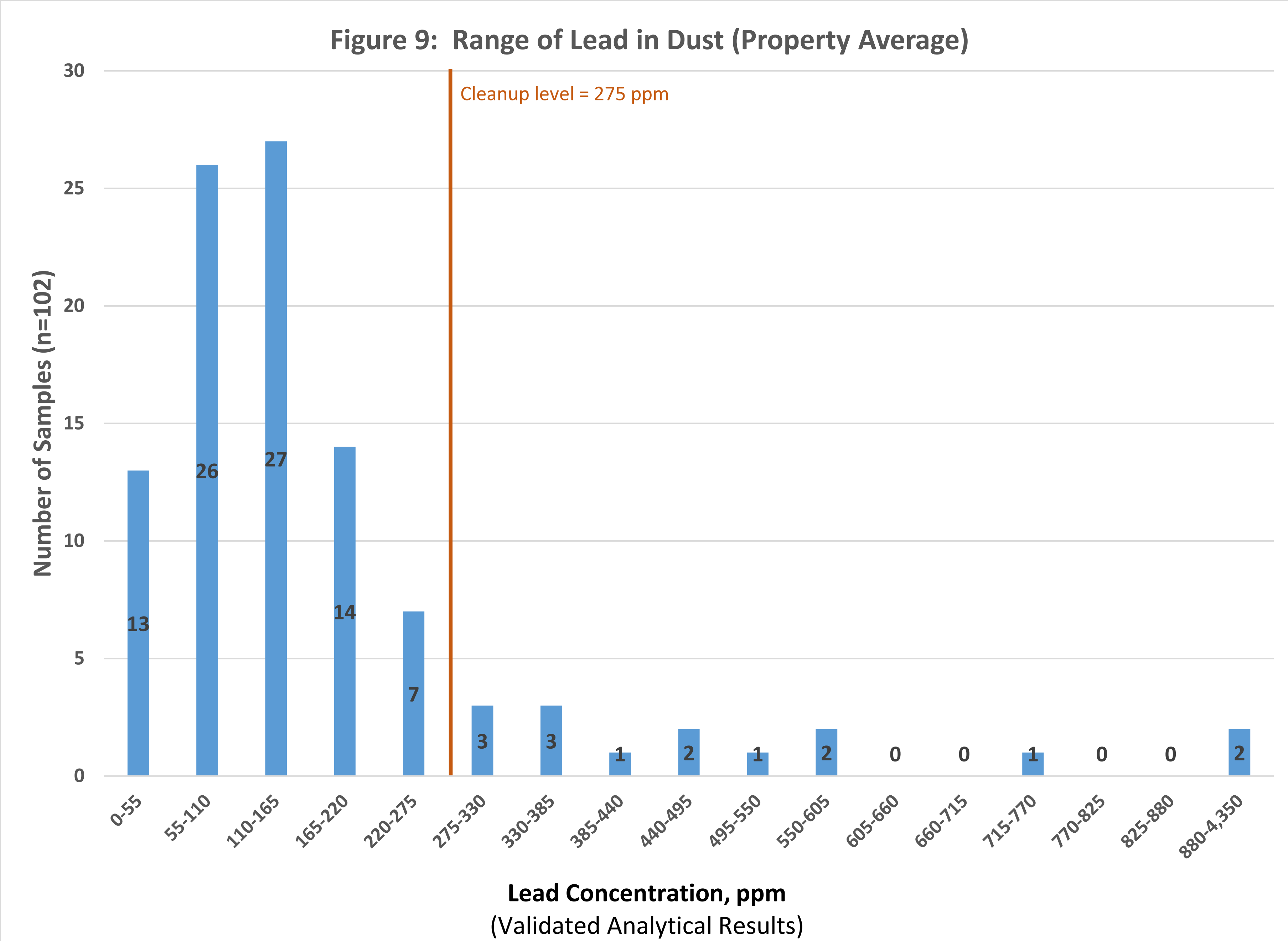

Figure 9: Range of Lead in Dust (Property Average)
Cleanup level = 275 ppm
Number of Samples (n=102)
0
5
10
15
20
25
30
13
26
27
14
7
3
3
1
2
1
2
0
0
1
0
0
2
0-55
55-110
110-165
165-220
220-275
275-330
330-385
385-440
440-495
495-550
550-605
605-660
660-715
715-770
770-825
825-880
880-4,350
Lead Concentration, ppm
(Validated Analytical Results)

Table 11: Evaluation of Remedy Components and Process Options for Residential Soil

General Remedy Components for Residential Soil	Remedial Technology Types	Process Options	Short- and Long-Term Effectiveness	Implementability	Relative Cost	Option Retained?
Containment Controls	Engineered Cover	Soil cover	Moderate	Low	Moderate	No
		Soil-clay cover	Moderate	Low	Moderate	No
		Asphalt cover	High	Low	High	No
		Concrete cover	High	Low	High	No
		Synthetic membrane	High	Low	High	No
Migration Controls	Surface Controls	Grading, revegetation, erosion controls	Low	Moderate	Moderate	Retained for use in conjunction with other process options
Soil Removal / Replacement	Excavation	Conventional earth moving	High	High	Moderate	Yes
	On-Site Disposal	Construct on-site waste repository	Moderate	Low	Low	No
	Off-Site Disposal	Dispose at appropriate landfill	High	High	Moderate	Yes
Soil Treatment	Chemical Treatment	Soil amendments	Moderate	Moderate	Low	No
	Physical Treatment	Soil tilling	Moderate	Moderate	Low	No

Table 12: Evaluation of General Response Actions and Process Options for Indoor Dust

Remedy Components for Indoor Dust	Remedial Technology Types	Process Options	Short and Long - Term Effectiveness	Implementability	Relative Cost	Option Retained?
Removal	Clean interior surfaces	Wet mopping floors	Moderate	High	Low	Retained for use in conjunction with other process options
		Washing walls	Moderate	High	Low	Retained for use in conjunction with other process options
		Vacuuming carpets	Moderate	High	Low	Retained for use in conjunction with other process options
	Replace interior surfaces	Remove and replace flooring	High	Moderate	Moderate	Retained for use in conjunction with other process options
Containment	Cover interior surfaces	Painting Walls, windowsills, etc	Moderate	High	Moderate	Retained for use in conjunction with other process options
		Install Plastic sheeting	Moderate	High	Low	Retained for use in conjunction with other process options

Table 14: Soil Removal to 12-inch Depth and Property Restoration Costs for a Typical 5,000-Square Foot Property

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Direct Capital					
Pre-removal coordination with homeowner					
Temporary Lodging and M&IE for Residents	3	days	$ 432.00	$ 1,300	
Remove Contaminated Soil					
Mobilize Equipment	1.00	ea	$ 624.16	$ 630	
Clear and Grub Yard	0.12	acre	$ 4,308	$ 520	
Perform hand digging with loading (35% of total)	64.81	bcy	$ 57.29	$ 3,720	
Perform machine digging with loading (65% of total)	120.37	bcy	$ 3.88	$ 470	
Haul Contaminated Soil to Pueblo Landfill (average distance 6 miles)	240.74	lcy	$ 11.76	$ 2,840	
Tipping Fee for Disposal of Contaminated Soil	361.11	tons	$ 10.66	$ 3,850	
Restore Property (Outside)				$ -	
Place orange safety fence at base of excavation	5000.00	sf	$ 0.08	$ 400	
Clean Common Borrow Fill (Material Only)	120.37	lcy	$ 17.32	$ 2,090	
Clean Topsoil (Material Only)	120.37	lcy	$ 34.26	$ 4,130	
Haul Clean Borrow and Topsoil	240.74	lcy	$ 11.76	$ 2,840	
Place, grade, and compact fill and topsoil in 6-inch lift with skid steer	2.00	ea	$ 1,488.76	$ 2,980	
Install Irrigation System	4000.00	sf	$ 1.05	$ 4,200	
Demobilize Equipment	1.00	ea	$ 624	$ 630	
Install Sod	4.00	msf	$ 710	$ 2,850	
Landscaping Allowance (to replace flowers and shrubs)	1.00	ls	$ 500	$ 500	
				Subtotal Direct Capital	$ 32,700
Indirect Capital (as percentages of Direct Capital)					
Remedial Design (6%)				$ 1,960	
Project Management and Work Plans (5%)				$ 1,640	
Mobilization/Demobilization (2%)				$ 650	
Construction Management and Field Oversight (6%)				$ 1,960	
Field Equipment and Supplies (1%)				$ 330	
Bid and Scope Contingency (10%)				$ 3,270	
				Subtotal Indirect Capital	$ 9,800
				Total Capital	$ 42,500
OPERATING AND MAINTENANCE (O&M) COST ITEM	**ANNUAL COST**	**Present worth cost of annual O&M (n = 3 years)**			
Year 1 Maintenance, Monitoring, Reporting	$ 1,100				
Year 2 Annual Maintenance, Monitoring & Reporting	$ 560				
Year 3 Annual Maintenance, Monitoring & Reporting	$ 560				
				Present Worth Cost of Annual O&M	$ 2,300
TOTAL PRESENT WORTH COST (Sum of Total Capital and Present Worth Cost of Annual O&M)					**$ 44,800**

Capital and annual costs are 2016

bcy = bank cubic yards; lcy = loose cubic yard; sf = square feet
ea = each; ls = lump sum
ecy = each cubic yard; msf = thousand sqare feet

Table 15: Soil Removal to 18-inch Depth and Property Restoration Costs for a Typical 5,000-Square Foot Property

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Direct Capital					
Pre-removal coordination with homeowner					
Temporary Lodging and M&IE for Residents	4	days	$ 432.00	$ 1,730	
Remove Contaminated Soil					
Mobilize Equipment	1	ea	$ 624.16	$ 630	
Clear and Grub Yard	0.12	acre	$ 4,308	$ 520	
Perform hand digging with loading (35% of total)	97	bcy	$ 57.29	$ 5,580	
Perform machine digging with loading (65% of total)	181	bcy	$ 3.88	$ 700	
Haul Contaminated Soil to Pueblo Landfill (average distance 6 miles)	361	lcy	$ 11.76	$ 4,250	
Tipping Fee for Disposal of Contaminated Soil	542	tons	$ 10.66	$ 5,780	
Restore Property (Outside)					
Place orange safety fence at base of excavation	5000	sf	$ 0.08	$ 400	
Clean Common Borrow Fill (Material Only)	240.5	lcy	$ 17.32	$ 4,170	
Clean Topsoil (Material Only)	120.3	lcy	$ 34.26	$ 4,120	
Haul Clean Borrow and Topsoil	360.8	lcy	$ 11.76	$ 4,250	
Place, grade, and compact fill and topsoil in 6-inch lift with skid steer	3.0	ea	$ 1,488.76	$ 4,470	
Install Irrigation System	4,000	sf	$ 1.05	$ 4,200	
Demobilize Equipment	1	ea	$ 624	$ 630	
Install Sod	4	msf	$ 710	$ 2,850	
Landscaping Allowance (to replace flowers and shrubs)	1	ls	$ 500	$ 500	
				Subtotal Direct Capital	$ 43,100
Indirect Capital (as percentages of Direct Capital)					
Remedial Design (6%)				$ 2,590	
Project Management and Work Plans (5%)				$ 2,160	
Mobilization/Demobilization (2%)				$ 860	
Construction Management and Field Oversight (6%)				$ 2,590	
Field Equipment and Supplies (1%)				$ 430	
Bid and Scope Contingency (10%)				$ 4,310	
				Subtotal Indirect Capital	$ 12,900
				Total Capital	$ 56,000
OPERATING AND MAINTENANCE (O&M) COST ITEM	**ANNUAL COST**	**Present worth cost of annual O&M (n = 3 years)**			
Year 1 Maintenance, Monitoring, Reporting	$ 1,100				
Year 2 Annual Maintenance, Monitoring & Reporting	$ 560				
Year 3 Annual Maintenance, Monitoring & Reporting	$ 560				
				Present Worth Cost of Annual O&M	$ 2,300
TOTAL PRESENT WORTH COST (Sum of Total Capital and Present Worth Cost of Annual O&M)					**$ 58,300**

Capital and annual costs are 2016

bcy = bank cubic yards; lcy = loose cubic yard; sf = square feet
ea = each; ls = lump sum
ecy = each cubic yard; msf = thousand sqare feet

Table 16: Internal Dust Cleaning Costs for a Typical 1,500-Square Foot Home Plus Basement

CAPITAL COST ITEM	QTY	UNIT	UNIT PRICE	COST	TOTALS
Direct Capital					
Pre-removal coordination with homeowner					
Temporary Lodging and M&IE for Residents	3	days	$ 432.00	$ 1,300	
Rent Temporary Storage Box	0.10	month	$ 120.60	$ 20	
Move Items to Temporary Storage	1	days	$ 1,740	$ 1,740	
Perform Internal House Cleaning					
Duct Cleaning and Furnace Filter Replacement	1	ls	$ 400	$ 400	
Remove Carpet and Pad	150	sf	$ 0.28	$ 50	
Replace Carpet and Pad	16.7	sy	$ 42	$ 700	
Pre-Clean, HEPA Vacuum & Wet Wipe (verify clean w/XRF)					
Floors and Ceilings	3796	sf	$ 0.32	$ 1,220	
Walls	3040	sf	$ 0.32	$ 980	
Perform Second Cleaning on 20% of total surface area	1367	sf	$ 0.32	$ 440	
Return Items from Storage to House	1	days	$ 1,740	$ 1,740	
				Subtotal Direct Capital	$ 8,600
Indirect Capital (as percentages of Direct Capital)					
Remedial Design (6%)				$ 520	
Project Management and Work Plans (5%)				$ 430	
Mobilization/Demobilization (2%)				$ 170	
Construction Management and Field Oversight (6%)				$ 520	
Field Equipment and Supplies (1%)				$ 90	
Bid and Scope Contingency (10%)				$ 860	
				Subtotal Indirect Capital	$ 2,600
				Total Capital	$ 11,200
TOTAL PRESENT WORTH COST (Sum of Total Capital and Present Worth Cost of Annual O&M)					**$ 11,200**

Capital and annual costs are 2016

bcy = bank cubic yards; lcy = loose cubic yard; sf = square feet
ea = each; ls = lump sum
ecy = each cubic yard; msf = thousand sqare feet

Table 17: ARAR Summary Colorado Smelter Superfund Site OU1

ARAR Type	Authority	Medium/ Activity	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
SURFACE WATER						
Action-specific	State Regulatory Requirement	Discharge Water	Colorado Discharge Permit System Regulations, 5 CCR 1002-61, Regulation No. 61, pursuant to CRS § 25-8-501 to 509	Applicable	Establishes program for permitting discharges of contaminants into waters of the United States within Colorado including discharges of stormwater during construction activities.	The substantive requirements of these regulations will be met for any potential stormwater discharges during construction. Under Section 121(e)(1) of CERCLA a permit is not required.
Action-specific	State Regulatory Requirement	Discharge Water	Colorado Water Quality Control Act Stormwater Discharge Regulations, 5 CCR 1002.2	Applicable	Establishes stormwater control requirements for construction activities.	Potentially applicable if construction activities involve stormwater discharges as part of the remedial action.
Location-specific	Federal Regulation	Wetlands	Clean Water Act Section 404 (33 USC 1251, et seq; 40 CFR 230, 231)	Applicable	Requires Federal agencies to avoid, to the extent possible, adverse impacts associated with destruction or loss of wetlands. Regulates the discharge of dredged or fill material into waters of U.S. Consultation with the Regional Response Team required.	Wetlands may be present in OU1. Regulations are applicable only if remedial activities impact the wetlands areas. Remedial design will avoid, to the extent possible, impacts to any wetlands, if present.
Location-specific	Federal Executive Order	Wetlands	(i) Executive Order No. 11990 Protection of Wetlands	(i) TBC	Requires Federal agencies to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands. The Executive Order is TBC because it is not a promulgated regulation. Nonetheless, EPA is required to comply with the Executive Order.	If wetlands are present and impacted, mitigation actions will be conducted.
Location-specific	Federal Executive Order	Floodplains	(i) Executive Order No. 11998 Floodplain Management	(i) TBC	Requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, the adverse impacts associated with direct and indirect development of a floodplain.	Remedial design will avoid, to the extent possible, impacts to any floodplains, if present.
AIR						
Action-specific	State Regulatory Requirement	Construction	Colorado Air Quality Control Act (5 CCR § 1001-1, 2, 3, 4, 5, 8, 10)	Applicable	Establishes emissions standards for PM10 and lead. Pursuant to the Colorado Air Pollution Prevention and Control Act, applicants for construction permits are required to evaluate whether the proposed source will exceed NAAQs. Applicants are also required to evaluate whether the proposed activities would cause the Colorado ambient standard for PM10 to be exceeded. Colorado regulates	Compliance with applicable provisions of the Colorado Air Quality requirements will be achieved by adhering to a fugitive emissions control plan prepared in accordance with Regulation No. 1. The remedial actions considered in this FFS are not expected to exceed the emission levels for lead, although some lead emissions may occur.

Table 17: ARAR Summary Colorado Smelter Superfund Site OU1

ARAR Type	Authority	Medium/ Activity	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
					fugitive emissions through Regulation No. 1. Regulation 8 sets emission limits for lead. Applicants are required to evaluate whether the proposed activities would result in the Regulation 8 lead standard being exceeded.	Compliance with Regulation 8 will be achieved by adhering to a fugitive emissions control plan prepared in accordance with Regulation No. 1. The substantive requirements of Regulation 3 are potentially applicable.
Action-specific	State Regulatory Requirement	Construction	Colorado Fugitive Dust Control Plan/Opacity, Regulation No. 1., 5 CCR 1001-3, pursuant to Colorado Air Pollution Prevention and Control Act, CRS § 25-7-101 *et seq.*	Applicable	Establishes regulations concerning fugitive emissions from construction activities, storage and stockpiling activities, and haul trucks.	Dust suppression will be used as needed during construction and maintenance of the remedy.
Action-specific	State Regulatory Requirement	Construction	Colorado Air Pollution Prevention and Control Act, APENs Regulation No. 3, 5 CCR 1001-5, Regulation 3	Applicable	Establishes emissions control regulations for construction or modification of stationary sources.	Substantive requirements of an Air Pollution Emission Notice (APEN) are applicable if the remedial actions disturb contaminated soil. An APEN will be filed, although under Section 121(e)(1) under CERCLA a permit is not required.
Action-specific	State Regulatory Requirement	Construction	Colorado Air Pollution Prevention and Control Act, Odors, Regulation No. 2, 5 CCR 1001-4	Applicable	Applies to any remedial action that may create regulated odors; e.g., diesel equipment	Planned remedial actions are not expected to create regulated odors.
SOLID AND HAZARDOUS WASTE MANAGEMENT						
Action-specific	State Regulatory Requirement	Hazardous Waste	Colorado Hazardous Waste Regulations, 6 CCR 1007-3, Part 264: Section 264.301, (g), (h), (i) and (j); Section 264.310 (a)(1) through (a)(4); Section 264.310, (b)(1) and (b)(5)	Applicable	Specific provisions of Section 264.301 concern run-on control, run-off control, management of run-on and run-off control systems and wind dispersal. Specific provisions of Section 264.310 concern placement of a cover to minimize infiltration, minimize maintenance, promote drainage and minimize erosion and accommodate settling.	These specific provisions of the hazardous waste regulations may be relevant and appropriate in certain circumstances depending on site specific conditions (e.g., if hazardous waste is encountered). The determination of whether such requirements will be both relevant and appropriate to the activities to be undertaken in OU1 will be based on best professional judgment and is conducted on a site specific basis taking into account the physical nature and location of the media involved, whether the requirements are well

Table 17: ARAR Summary Colorado Smelter Superfund Site OU1

ARAR Type	Authority	Medium/ Activity	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
						suited to the site conditions, and other factors.
Non-ARAR requirement for an off-site activity	Federal Regulation	Hazardous Waste	Hazardous Materials Transportation Act, Regulations, 49 USC Sect. 1801 - 1813, 49 CFR Parts 107, 171-177	Comply with offsite requirement	Regulates transportation of hazardous materials.	Though not an ARAR, compliance required if the remedial action involves off-site transportation of hazardous materials. The regulations affecting packaging, labeling, making, placarding, using proper containers, and reporting discharges of hazardous materials would be potential ARARs.
MINING RECLAMATION						
Action-specific	State Regulatory Requirement	Soil	Colorado Noxious Weed Act and regulations, CRS § 35-5.5-101-119; 8 CCR 1203-19	Applicable	Colorado regulations addressing management of noxious weeds.	Revegetated areas and other areas impacted by the cleanup will be monitored for the presence of noxious weeds and weed management will be used if needed.
ENVIRONMENTAL COVENANTS						
Location-specific	State Statutory Requirement	Sitewide	Colorado Environmental Covenants, CRS §§ 25-15-317 et seq	Applicable	Requires environmental covenants (ECs) or notice of environmental use restrictions (RNs) whenever residual contamination is left in place at properties and at levels above unlimited use and unrestricted exposure or an engineered feature or structure that requires monitoring, maintenance, or operation is included in the remedy.	The substantive provisions of CRS §§ 25-15-317, et seq. are ARARs. Creation of a legal EC or RN is dependent on compliance with procedural or administrative provisions and the discretion of CDPHE. CDPHE states through concurring on this Interim ROD that if the EC or RN presented to CDPHE for acceptance or approval includes the Land Use Restrictions set forth in this Interim ROD, is signed or approved by the landowner, and follows the provisions of the Colorado Environmental Covenant Statute, CDPHE will accept the EC. Further, CDPHE states through concurrence on this Interim ROD that ECs and RNs will only be modified or terminated to reflect changes made to the Superfund remedy.

Table 17: ARAR Summary Colorado Smelter Superfund Site OU1

ARAR Type	Authority	Medium/ Activity	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
NOISE CONTROL						
Action-specific	State	Construction	Colorado Noise Abatement Statute, CRS §§ 25-12-101-109	Applicable	Establishes maximum permissible noise levels for particular time periods and land use zones.	Noise restrictions will be followed as needed during construction and maintenance of the remedy.
HISTORIC AND CULTURAL RESOURCES						
Location-specific	State	Construction	Colorado Historical, Prehistorical, and Archaeological Resources Act, Colorado Revised Statutes (CRS) §§ 24-80-401 to 411, 24-80-1301 to 1305	Applicable	Establishes procedures and requires a permit for investigation, excavation, gathering, or removal from the natural state of any historical, prehistorical, or archaeological resources on state lands for the benefit of recognized scientific or educational institutions. Also requires an excavation permit and notification if human remains are found on state land.	May be applicable if archaeological resources are removed or human remains discovered during remedial activities; coordination with state archaeologist required, but no permit is needed within the Superfund site.
Location-specific	State	Construction	Colorado Register of Historic Places, CRS §§ 24-80-101 to 108	Applicable	Establishes requirements for protecting properties of historical significance.	May be applicable if remedial actions impact any property listed on the Register of Historic Places.
Location-specific	Federal Executive Order and Regulation	Construction	(i) Executive Order No. 11593 Protection and Enhancement of the Cultural Environment; (ii) 16 USC 470	TBC	Requires federal agencies to institute procedures to ensure programs contribute to the preservation and enhancement of non-federally owned historic resources. Consultation with the Advisory Council on Historic Preservation required.	May be applicable if remedial actions impact any property affected by this regulation.
Location-specific	Federal Regulation	Construction	National Historic Preservation Act (NHPA), 16 USC § 470 et seq.; 40 CFR § 6.301(b); 36 CFR Part 63, Part 65, Part 800	Applicable	Expands historic preservation programs to minimize harm to National Historic Landmarks; requires preservation of resources included in or eligible for listing on the National Register for Historic Places (NRHP).	May be applicable if remedial actions impact any property affected by this regulation.
Location-specific	Federal Regulation	Construction	The Historic and Archaeological Data Preservation Act of 1974, 16 USC 469 40 CFR § 6.301(c)	Applicable	Establishes procedures to preserve historical and archeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity program.	Remedial Activities may affect historical and/or archeological data. A cultural resources survey will be performed to identify and evaluate all historic properties, if any, which may be affected by remedial activities.