Technical Assistance Services *for* Communities
Colorado Smelter Superfund Site

Review of Quality Assurance Project Plans (QAPPs)

Introduction

The Colorado Smelter Community Advisory Group (CAG) asked the Technical Assistance Services for Communities (TASC) program for assistance with reviewing technical documents. TASC has completed a review of the Quality Assurance Project Plans (QAPPs), also referred to as sampling plans, for EPA's pilot study – the Demonstration of Methods Applicability (DMA) and remedial investigation (RI) – at the Colorado Smelter Superfund site. This fact sheet summarizes the findings from the TASC review.

Background

The Colorado Smelting Company smelter began operating in 1883 and closed in 1908. The Colorado Smelter was constructed on a mesa in south Pueblo. Waste slag from the smelter was deposited in a ravine between Santa Fe Avenue and the Denver & Rio Grande railroad tracks. Smelting operations contaminated the former smelter site and surrounding areas with lead and arsenic, and possibly other metals.

The Colorado Smelter historic footprint is bordered 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 and Eilers neighborhoods are located next to it. Site features include building remains and an almost 700,000-square-foot slag pile.

On December 11, 2014, EPA added the former Colorado Smelter to the Superfund program's National Priorities List (NPL). EPA has started the site's remedial investigation and feasibility study (RI/FS). To manage the cleanup, EPA divided the site into two operable units (OUs), OU1 (Community Properties) and OU2 (Former Smelter Area). The RI identifies site contamination and its location. The FS looks at and evaluates different cleanup options, such as removal and replacement of soils.

What Is a QAPP?

A Quality Assurance Project Plan, or QAPP, is a written document outlining the procedures during an environmental project that will ensure data collection and analysis meets project requirements. It builds quality control steps into the project sampling plan from the beginning. A QAPP ensures that collected data can be used with scientific confidence in environmental decision-making.

A QAPP is required for any EPA-funded project that involves environmental data generation, such as soil or water sampling. EPA must approve a QAPP before sampling activities can begin.

Purpose of the DMA and RI QAPPs

The DMA QAPP supported the pilot study for the assessment of soils at 12 residential properties and six locations at the former smelter/slag area. Figure 1 shows the locations of the soil samples taken during the pilot study. Figure 1 is adapted from Figures 2-1 and 2-2 in the final DMA Report.

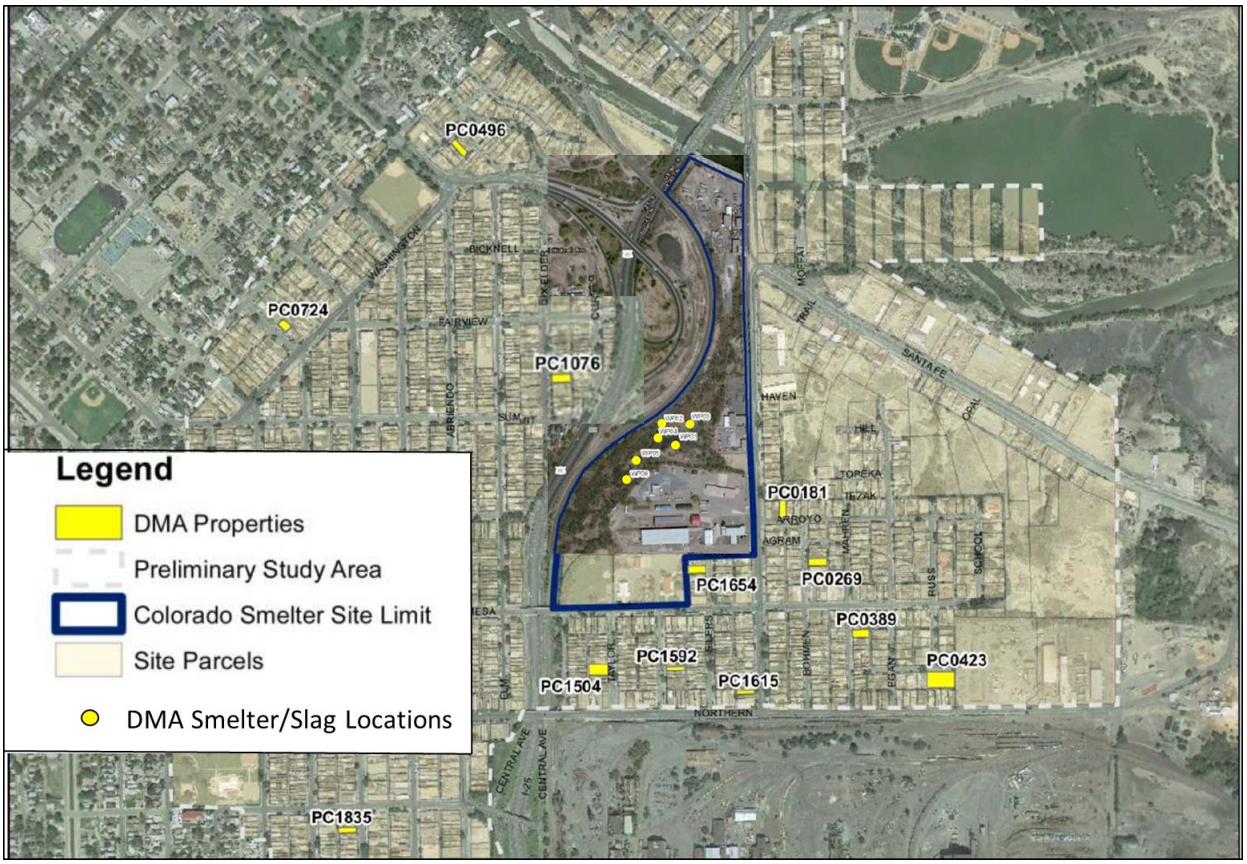

Figure 1. DMA Soil Sample Locations

The purpose of the DMA pilot study was to determine the best and most efficient sampling and analytical procedures to use during the RI.

The RI QAPP will support the RI sampling plan for the assessment of soils and indoor dust at up to 1,200 residential properties as well as soils at parks, schools, commercial properties and alleys.

EPA will follow RI QAPP procedures to get data to:

- Support the findings of the RI/FS.
- Support EPA in conducting a human health risk assessment (HHRA).
- Determine the relative bioavailability of arsenic and lead in smelter-related soils.
- Refine contaminants of potential concern (COPCs) that will be characterized during the RI/FS (soil samples will be tested for additional metals besides arsenic and lead).

Key Sections of the QAPPs

Both QAPPs (DMA and RI) include:

- Site description, history and background.
- Project approach overview.
- Review of historical information and data.
- Systematic planning.
- Background study design and implementation (to be done under a separate QAPP).
- Sampling design and implementation.

Both QAPPs include 37 worksheets. They provide details on ensuring data quality and effective project management. A few worksheets that may be of particular interest to community members are discussed in the following paragraphs.

QAPP Worksheet #17 describes the soil sampling design and rationale. For the pilot study, sampling teams collected soil samples from five points in distinct areas (front, back and/or side yards, and roof drip zones) of 12 residential properties to a depth of 18 inches below the ground surface. They also collected soil samples from 30 points from 10 distinct areas at eight of the 12 properties. The goal was to compare sampling approaches and data

variability to determine the best approach for the full residential sampling event.

Soil from each sample was separated into four smaller samples by depth ranges of 0 to 1 or 2 inches (depending on if there was grass on top of the soil), 1 or 2 to 6 inches, 6 to 12 inches, and 12 to 18 inches. Soil from the same depth range for each of the five samples or each of the 30 samples were mixed together to form a composite sample for each depth range. Figure 2 shows a typical five-point sampling plan. A five-point composite sample is a sample made up of a mixture of soil from the five different locations at the same depth below ground surface. Each of the five separate portions of soil from each of the five locations is called an aliquot.

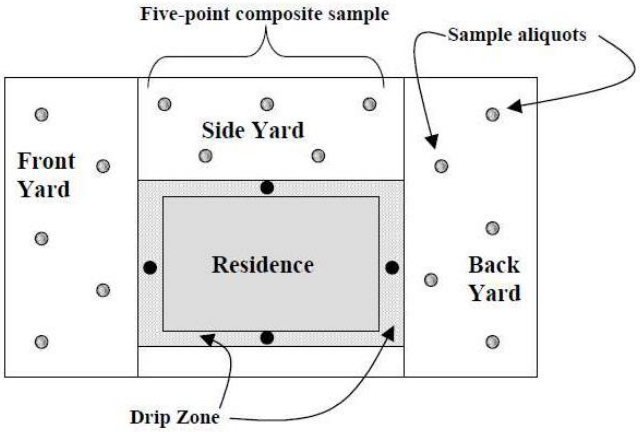

Figure 2. Typical Five-Point Sampling Plan

For the DMA, triplicate five-point and 30-point samples were collected from eight yards. The duplicate and triplicate sampling took place at different locations, resulting in 15 total sample locations for the five-point sampling and 90 sample locations for the 30-point sampling in any distinct area of a residential property.

For the RI, triplicate five-point composites will be collected at a frequency of one triplicate sample set per 20 investigative samples. For distinct areas exceeding 5,000 square feet at the site, 30-point samples will be taken. Triplicate samples will be collected from about 5 percent of these larger areas.

QAPP Worksheet #28 describes how laboratory quality will be controlled and checked. Laboratory results are controlled by calibrating equipment on a preset schedule, as well as by analyzing duplicate and triplicate samples, samples with known amounts of contaminant (spiked samples) and samples with no contaminant (blanks).

QAPP Worksheet #29 describes how project data is managed using SCRIBE, a software tool, and EPA's Data System of Record. See Figure 3.

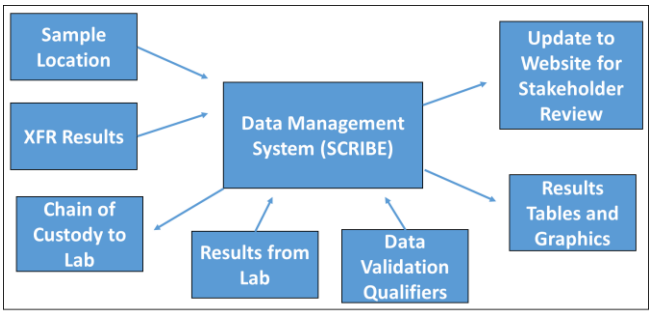

Figure 3. Illustration of Data Management System

QAPP Worksheets #34, 35 and 36 describe the steps taken to verify and validate the data acquired from sampling and analysis. This includes review of field notes, chain of custody records for transport of samples, and laboratory data.

QAPP Worksheet #37 describes the procedures and methods that will be used to determine whether data from the DMA and RI are of the right type, quality and quantity to support environmental decision-making for the project.

How RI QAPP Used DMA Results

The DMA pilot study results were used to determine and finalize sampling and analytical procedures for the 1,200 residential properties and other OU1 locations to be sampled during the RI. The DMA Report answered three primary questions.

Can field equipment produce adequate quality results? **Yes.**
Based on a comparison of data from the x-ray fluorescence (XRF) spectrophotometer used in the field to laboratory results, EPA determined that XRF data are of sufficient quality for RI decision-making.

Is it important for EPA to sample soil to a depth of 18 inches? **Yes.**
DMA data indicate that all four depths (0-1 or 2 inches, 1 or 2 to 6 inches, 6 to 12 inches, 12 to 18 inches) should continue to be investigated as part of the full sampling effort during the RI.

Is five-point sampling adequate? **Yes**.
Laboratory tests confirmed that data variability was low and results from the five-point sampling are adequate for RI sampling.

Summary of DMA Results

Tables 1 and 2 summarize the highest *average* arsenic and lead concentrations at four depth ranges below the ground surface in any of the three to six distinct areas of each of the 12 residential properties, as shown in Table 6-8 of the DMA Report.

Tables 1 and 2 show that:

- All 12 properties had arsenic concentrations above 11 ppm, which is the typical Colorado background for all land uses.[1]
- Samples from three yards had arsenic concentrations over 100 mg/kg or parts per million (ppm).
- Eleven out of 12 sampling locations had levels of lead greater than the national residential screening level of 400 mg/kg or ppm.[2]
- A sample from one yard had a lead concentration over 2,500 ppm.

Typically, soil is not cleaned up if a contaminant concentration is below EPA's soil screening level or the local background level. If a contaminant concentration is above these levels, then additional follow-on investigations determine an appropriate cleanup level. One component of the RI will be an evaluation of the bioavailability of arsenic and lead found in smelter-affected soils. Bioavailability is a measure of the extent to which these metals are taken up into the bloodstream of a person.

Table 1. Average Arsenic Concentration (mg/kg)

Property #	0-1 or 2 inches	1-6 inches	6-12 inches	12-18 inches
0181	17.7	22.8	28.8	27.3
0269	12.0	12.5	11.3	8.23
0389	113	59.5	55.5	24.9
0423	8.57	13.4	12.7	14.8
0496	10.6	11.3	8.37	6.4
0724	12.1	15.2	14.8	12.5
1076	14.7	16.1	13.5	9.18
1504	13.7	11.4	16.3	11.0
1592	80.4	150	150	143
1615	27.9	30.8	31.1	25.0
1654	76.2	203	116	49.0
1835	20.3	14.5	14.0	8.96

mg/kg = milligrams per kilogram of soil

Table 2. Average Lead Concentration (mg/kg)

Property #	0-1 or 2 inches	1-6 inches	6-12 inches	12-18 inches
0181	489	619	701	786
0269	459	345	233	106
0389	525	633	658	383
0423	351	537	415	487
0496	497	537	304	168
0724	175	215	225	372
1076	554	546	363	280
1504	444	376	518	213
1592	491	637	627	579
1615	592	794	580	461
1654	1,031	2,650	1,647	815
1835	717	455	438	201

mg/kg = milligrams per kilogram of soil

Conclusion

The DMA QAPP and DMA (pilot study) report provided valuable information used by EPA to write the RI QAPP (RI sampling plan). The RI QAPP will be used by EPA to ensure that data can be used with confidence in environmental decision-making.

TASC provides independent technical assistance to communities. Information in this document may or may not reflect the opinion or policy of EPA.

[1] https://www.colorado.gov/pacific/sites/default/files/HM_arsenic-in-soil-risk-mgt.pdf

[2] http://semspub.epa.gov/work/03/2220593.pdf