

**SAMPLING AND ANALYSIS PLAN
FOR
BULLION CANYON – REMOVAL ASSESSMENT
MARYSVALE, PIUTE COUNTY, UTAH**

Prepared for
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 8

Prepared by
WESTON SOLUTIONS, INC.
Region VIII Superfund Technical Assessment and Response Team

October 15, 2015

For approval signatures, see Worksheet 1 & 2.

Project Dates of Sampling:	Week of October 26, 2015
CERCLA ID / Site Spill Identifier No.:	A8K8
Contract Name:	START IV
Contract No.:	EP-S8-13-01
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SAP Revision Log

Site: Bullion Canyon
OSC: Martin McComb
TDD: 0001/1509-06

Date	Revision Number	Reason for Change of Scope/Procedures	SAP Section Superseded	Requested By	Approved By

List of Acronyms

°C	degrees Celsius
%D	percent difference
%R	percent recovery
%RSD	percent relative standard deviation
ACM	asbestos containing material
AES	Atomic Emission Spectrometry
ANSI	American National Standards Institute
APP	Accident Prevention Plan
ARAR	applicable or relevant and appropriate requirements
ASQ	American Society for Quality
AST	aboveground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
B	bias
CA	Corrective Action
CB	calibration blank
CCB	continuing calibration blank
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERLIS	Comprehensive Environmental Response, Compensation, and Liability System
CHMM	Certified Hazardous Materials Manager
CLP	Contract Laboratory Program
cpm	counts per minute
CO	Contracting Officer
COC	Chain-of-Custody
COR	Contracting Officer Representative
Cr ⁺⁶	Hexavalent Chromium
CRL	Central Regional Laboratory
CRQL	Contract Required Quantitation Limits
CSM	Conceptual Site Model
CVAA	Cold Vapor Atomic Absorption
D	absolute range
DQI	Data Quality Indicator
DQO	Data Quality Objective
DRMS	Colorado Division of Reclamation, Mining and Safety
EDD	electronic data deliverable
EDX	Energy Dispersive X-Ray
ERM	Emergency Response Manager
ERT	Environmental Response Team
ESI	Expanded Site Inspection
FID	Flame Ionization Detector
FS	Feasibility Study
FSP	Field Sampling Plan

List of Acronyms

GC	gas chromatography
GC/MS	gas chromatography/mass spectrometry
GIS	Geographic Information System
HASP	Health and Safety Plan
HRGC/HRMS	high resolution gas chromatography/high resolution mass spectrometry
HRGC/LRMS	high resolution gas chromatography/low resolution mass spectrometry
HRS	Hazard Ranking System
HPLC	high performance liquid chromatography
ICB	initial calibration blank
ICP	inductively coupled plasma
IDW	investigation-derived waste
ISTD	Instrument Standard
ITRC	Interstate Technology and Regulatory Council
LBP	lead based paint
LCS	laboratory control sample
LOD	limit of detection
LOQ	limit of quantitation
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MPC	Measurement Performance Criteria
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NCP	National Contingency Plan
ND	non-detect
NIOSH	National Institute of Safety and Health
NPL	National Priorities List
NRCS	Natural Resource Conservation Service
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbons
PAL	Project Action Limit
PCB	Pesticides/Polychlorinated biphenyls
PCDD	Polychlorinated Dibenzo-p-Dioxins
PCDF	Polychlorinated Dibenzofurans
PCM	Phase Contrast Microscopy
P.E.	Professional Engineer
PID	Photoionization Detector
PLM	polarized light microscopy
PM	Project Manager
PMP	Project Management Professional
POC	Point of Contact
PQL	Project Quantitation Limit

List of Acronyms

PQO	Project Quality Objectives
PPE	Personal Protective Equipment
PT	proficiency testing
PTL	Project Team Lead
PUF	polyurethane foam
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QMP	Quality Management Plan
Ra	Radium
RA	Risk Assessment
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RL	reporting limit
RM	Removal Manager
RML	Removal Management Levels
RPD	relative percent difference
RSD	relative standard deviation
RSL	regional screening levels
SAP	Sampling and Analysis Plan
SAS	Special Analytical Services
SCDM	Superfund Chemical Data Matrix
SI	Site Inspection
SOP	Standard Operating Procedure
SRM	Standard Reference Material
SSL	soil screening level
START IV	Superfund Technical Assessment and Response Team 4
SVOC	Semi-volatile Organic Compounds
TAL	Target Analyte List
TBD	to-be-determined
TCL	Target Compound List
TDD	Technical Direction Document
TEM	transmission electron microscopy
TSA	Technical Systems Audit
UFP-QAPP	Uniform Federal Policy–Quality Assurance Project Plan
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
U.S. EPA	United States Environmental Protection Agency
USGS	United States Department of the Interior Geologic Survey
UST	underground storage tank
VOC	Volatile Organic Compounds
WAM	Work Assignment Manager

List of Acronyms

WESTON	Weston Solutions, Inc.
XRD	X-ray diffraction
XRF	X-Ray Florescence

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Introduction

This SAP identifies the data collection activities and associated QA/QC measures specific to the Bullion Canyon site (the Site) located in Marysvale, Piute County, Utah. All data will be generated in accordance with the quality requirements described in the Quality Assurance Project Plan for Region 8 CERCLA Removal and Emergency Response Activities in Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota (Weston 2013). The purpose of this SAP is to describe site-specific tasks that will be performed in support of the stated objectives. This SAP will reference the QAPP for generic tasks common to all data collection activities including routine procedures for sampling and analysis, sample documentation, equipment decontamination, sample handling, data management, assessment, and data review. Additional site-specific procedures and/or modifications to procedures described in the QAPP are described in the following SAP elements.

This SAP is prepared, reviewed, and approved in accordance with the procedures detailed in the QAPP. Any deviations or modifications to the approved SAP will be documented using the SAP Revision Form. This SAP is produced in accordance with the UFP for QAPPs and consists of the site-specific UFP Worksheets from the QAPP.

Project Organization and Team

Refer to the QAPP Worksheet 3 & 5, and 4, 7, & 8 for the program organizational chart, communication pathways, personnel responsibilities and qualifications, and special personnel training requirements. Project-specific information is provided below.

The following are key individuals identified for this project:

Name	Title/Role	Organization	Receive Copy of SAP?
Molly Patterson	Project Team Lead	Weston	Yes
Dave Robinson	Project Manager	Weston	Yes
Megan Oller	Project Engineer	Weston	Yes
Martin McComb	OSC	EPA	Yes

The individuals who will receive a copy of the Program QAPP are specified on QAPP Worksheet 3 & 5 (Project Organization and QAPP Distribution) as noted by the asterisk symbol adjacent to their names. The program QA Manager (QAPP Worksheet 4, 7 & 8) and the Project Manager will maintain the approved QA project plan consisting of the Program QAPP, Project SAP and SAP Document Review Crosswalk. The PTL will distribute the most current copy of the project QA documents via electronic or hard copy, as directed by the OSC. Files for this project will be kept in accordance with Section H.20 of Contract No.: EP-S8-13-01, stating a length of 10 years from close of the project or end of litigation.

QAPP Reference: Weston Solutions, Inc. 2013. Quality Assurance Project Plan for Region 8 CERCLA Removal and Emergency Response Activities in Colorado, Utah, Wyoming, Montana, North Dakota, and South Dakota. Prepared for the START IV Contract. July 2013.

Worksheet 1 & 2 — Title and Approval Page

(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

1. Project Identifying Information

- a) **Site Name/Project Name:** Bullion Canyon
- b) **Site Location/Number:** Marysvale, Piute County, Utah
- c) **Contract/Work Assignment Number:** EP-S8-13-01/0001/1509-06

2. List Plans and reports from previous investigation relevant to this project.

Utah Department of Environmental Quality Division of Environmental Response and Remediation. Site Inspection Analytical Results Report Bullion Canyon Mills. Piute County, Utah. March 29, 2006.

Utah Department of Environmental Quality Division of Environmental Response and Remediation. Site Inspection Analytical Results Report Dalton Mill. Piute County, Utah. January 25, 2005.

Utah Department of Environmental Quality Division of Environmental Response and Remediation. Site Inspection Analytical Results Report Bully Boy Mill. Piute County, Utah. December 9, 2004.

The undersigned approves the entire UFP-QAPP document which includes this SAP and other elements that are found in the Region 8 Removal and Emergency Response QAPP (Revision 1.0).

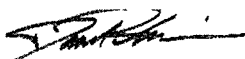
***Lead Investigative Organization's SAP Author:
/ Project Team Leader***

Molly Patterson/WESTON
Printed Name/Title

Signature/Date

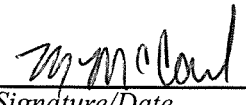
***Lead Investigative Organization's Project
Manager:***

Dave Robinson/WESTON
Printed Name/Title

 1016/15
Signature/Date

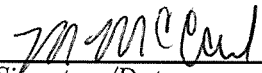
Federal Regulatory Agency OSC/Team Leader

Martin McComb/OSC
Printed Name/Title

 10-27-15
Signature/Date

**Federal Regulatory Agency/ Delegated
Approval Officer:**

Martin McComb/OSC
Printed Name/Title

 10-27-15
Signature/Date

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Worksheet 9 — Project Planning Session Summary

(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)

(EPA 2106-G-05 Section 2.2.5)

Date of Planning Session: October 12, 2015				
Location: Email				
Purpose: Scoping Email for Bullion Canyon				
Name	Title/Role	Organization	Phone No.	E-mail Address
Martin McComb	OSC	EPA	720.413.9190	McComb.Martin@EPA.gov
Molly Patterson	Project Team Lead/Scientist	WESTON	850-748-2951	Molly.Patterson@WestonSolutions.com

Notes/Comments: Discussed anticipated removal assessment activities, data management practices, and lab choices.

Consensus Decisions Made:

- Mobilize 2 START personnel, Project Team Lead and 1 Field Staff member.
- Field sampling should take three to four days (2 travel days, 1 to 2 field sampling days) during the week of October 26, 2015.
- START will perform the collection of two (surface and subsurface) 20-point composite soil samples for each sampling zone. There will be approximately 10-12 pre-determined sampling zones.
- Samples will be brought back to the EPA warehouse in Denver for prep and analysis.
- 10% of the dried and sieved samples will be sent to the ESAT lab for confirmatory analysis.
- START will mobilize 1 GSA vehicles loaded with equipment to/from Denver.

Action Items:

Action	Responsible Party	Due Date
Prepare for Field Work to Start on or before October 26, 2015	WESTON	TBD
Prepare SAP	WESTON	TBD
HASP	WESTON	TBD
SS DMP	WESTON	TBD

Worksheet 10 — Conceptual Site Model

(UFP-QAPP Manual Section 2.5.2)

(EPA 2106-G-05 Section 2.2.5)

Problem Definition:

The Bullion Canyon Mills site is located in the Tushar Mountains along Pine Creek just west of Marysvale, Utah. The Site is comprised of two separate campgrounds that have been constructed on top of tailings deposits. One campground is located on private property and regularly used by local residents. The other campground, Fireman's Park, is owned and operated by the Town of Marysvale. Fireman's Park is used by church, youth, and other groups for camping and other activities. During a site visit conducted on June 27, 2002, it was noted there was two private residences located near tailings piles within the site's boundaries.

EPA's Response Unit will be conducting a removal assessment of the soils on these properties. START will support this effort by performing field sampling and providing technical assistance.

Background Information/Site History:

The Bullion Canyon Mills site is located in Bullion Canyon along Pine Creek within the Tushar Mountains just west of Marysvale, Utah. The site occupies approximately 15 acres of land and contains three historic mills within the immediate area, Angel Mill, Apex Mill, and Holderman Mill. Angel Mill property is approximately 4.23 acres located on the western edge of the site and encompasses Fireman's Park. Apex Mill is approximately 4.97 acres and is located in the center of the site. Holderman Mill is approximately 5.76 acres and is located on the eastern edge of the site. All three historic mill locations were active from the 1860's through the early 1900's and primarily produced gold, silver, and other valuable metals. The tailings piles include only historic tailings since there are no active mills or mines currently in the area.

Previous Investigations

Investigations at the Bullion Canyon Mills site was conducted by the Utah Department of Environmental Quality/Division of Environmental Response and Remediation (DERR). The investigation included a Site Inspection (SI) with a work plan that encompassed surface water, sediment, groundwater, surface soil, and subsurface soil samples that were collected and analyzed for total metals. Sampling took place in August 2005.

During the SI performed in 2005 by DERR, it was noted that based on the validated analytical laboratory results, arsenic, lead, and mercury were present in soil and source samples in high enough concentrations to affect human health and the environment. Elevated levels of contamination of arsenic, lead, and mercury were also detected in surface water, surface soil, surface source, subsurface soil, and subsurface source samples. Arsenic, lead, and mercury were identified as the main contaminants of concern on-site. Tailings piles were observed on the Apex Mill property and the Holderman Mill property approximately 200 feet from residences for a total of 6 identified tailings piles identified on-site. No estimated tailings piles amounts or size were given in the SI report. Wildlife was also observed interacting with the tailings piles during the sampling event. Due to the site being utilized by church, youth and other groups for camping and other activities, on-site residential buildings, and wildlife activities, the elevated levels of the main contaminants of concern on-site were determined to pose a threat to human health and the environment.

Worksheet 11 — Project/Data Quality Objectives

(UFP-QAPP Manual Section 2.6.1)

(EPA 2106-G-05 Section 2.2.6)

1. State the Problem

The Bullion Canyon Mills site is located in the Tushar Mountains along Pine Creek. The Site is approximately 15 acres, encompasses three historic mills, two separate campgrounds, and two residences with a third residence nearby. Both of the campgrounds have been built on top of tailings piles and are frequently used by church, youth, and other groups for camping and other activities. EPA's Response Unit will be conducting a removal assessment of the soils on these properties. START will support this effort by performing field sampling and providing technical assistance.

2. Identify the Goals of the Study

The goals of the study are to assess assimilated data, identify gaps in analytical or reconnaissance data, and collect appropriate sampling and reconnaissance data to fill those data gaps.

- Where is additional sampling needed to identify metals contaminated soil?
- What is the extent of metals contamination originating from waste piles/source areas?
- What is the volume of each waste pile/source area?
- Has contamination been mobilized from waste pile/source areas via adjacent streams or other methods?
- If a Removal action is necessary, what are the options for such activity?
- If a Removal action is necessary, what type of information will be necessary to facilitate disposal?

3. Identify Information Inputs

Information that will be used to answer the above questions includes the following:

- Data from previous studies will be compiled and geospatially located to determine areas where existing characterization is sufficient for decision making.
- In situ X-Ray Fluorescence (XRF) analysis will be utilized to identify areas of metals contamination.
- Surface and subsurface soil samples from source areas and adjacent to source areas will be collected, prepped, and analyzed using XRF instrumentation.

- Ten percent of samples will be sent to the laboratory for metals analysis as confirmation of the XRF results.
- Field sampling data will be recorded electronically in a Scribe mobile field sampling application on an iPad or Scribe compatible data dictionary on a Trimble GPS unit and uploaded into a Site-specific Scribe database.
- Additional field reconnaissance data, including waste pile and stream bed data, may be collected using a Trimble GPS unit or a Site-specific FileMaker assessment form (TBD).
- Sampling locations will be geospatially and photographically documented.
- All data will be loaded to the Site-specific geospatial viewer for operational purposes.
- Additional documentation may be collected from Piute County, the State of Utah, or the Town of Marysvale. All documentation will be loaded to the Site-specific EPAOSC.net website.

4. Define the Boundaries of the Study

- Assessment activities, including sampling and field reconnaissance, will be conducted on or before October 2015 and will be scheduled as follows:
 - Week 1: sampling (utilizing hand auger for subsurface) and mobile mapping of waste piles at mill sites.
- Sampling will be conducted from the surface to a depth of no more than 6 inches.
- Sampling zones will be delineated from the AOIs by the OSC.

5. Develop the Analytic Approach

In situ screening for metals in soil will be conducted using the XRF instrument. A number of soil samples will be collected, prepped and analyzed using the XRF instrument in the START laboratory. The number of samples collected for preparation and XRF analysis will be determined in the field based on professional judgment.

Samples will be analyzed at an independent laboratory as follows:

- Ten percent of surface and subsurface soil samples collected for field XRF analysis will be submitted to the laboratory for TAL metals analysis.

Analytical sample results will be reviewed and verified by a WESTON START chemist to determine data usability. Analytical results will be compared to EPA Regional Screening Levels (RSLs) for residential soil and additional criteria as determined by the OSC. The OSC will develop site specific criteria for determining if a removal action is necessary.

6. Specify Performance or Acceptance Criteria

All data will be reviewed and verified to ensure that they are acceptable for the intended use. Limited data validation will be performed as described in Worksheet #36.

Sampling error will be limited to the extent practicable by following approved U.S. EPA methods and applicable SOPs listed in Worksheet #21. Sampling error and tolerable limits cannot be quantified.

7. Develop the Detailed Plan for Obtaining Data

Data will be collected per the sampling design and rationale provided in Worksheet 17. Sample nomenclature is described in Worksheet 17, Identification and Handling. Sample descriptions will be logged in the field logbook using standard geologic descriptions. Documentation of assessment activities will be collected using a FileMaker Pro form loaded onto an iPad. Sampling data will be collected using the Scribe Mobile Application loaded onto an iPad or a Scribe compatible data dictionary on a Trimble GPS unit. Data will be entered into Scribe for data management and reporting purposes. Chain of custody forms will be generated from the Scribe database. A Scribe compatible EDD will be requested from the laboratory for importing analytical results into the database. Geospatial data will be collected using the iPad loaded with the ESRI mobile application and a Bluetooth connected GPS or a Trimble GPS unit.

Worksheet 14 & 16 —Project Tasks & Schedule

(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Develop a Draft SAP and the EPA Region 8 QA Document Review Crosswalk	WESTON	10/02/15	TBD	Draft SAP and the Draft EPA Region 8 QA Document Review Crosswalk	TBD
Address EPA comments on Draft SAP and the Draft EPA Region 8 QA Document Review Crosswalk	WESTON	TBD	TBD	SAP and the Final EPA Region 8 QA Document Review Crosswalk	TBD
SS DMP	WESTON	10/02/15	10/02/15	SS DMP	TBD
HASP	WESTON	10/02/15	10/15/15	HASP	TBD
Mobilization/Demobilization	WESTON	10/26/15	10/29/15	NA	NA
Sample Collection Tasks	WESTON	10/27/15	10/28/15	Field Notes	TBD
Analytical Tasks	WESTON	10/30/15	TBD	Field Notes/Laboratory Reports	TBD
Validation	WESTON	TBD	TBD	Validation Summary Report	TBD
Summarize Data	WESTON	TBD	TBD	Data Report	TBD

Reports to management will be written and distributed in accordance with the QAPP Worksheet #6.

Worksheet 15 — Project Action Limits and Lab-Specific Detection/Quantitation Limits

(UFP-QAPP Manual Sections 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

The following information will be provided for each matrix, analyte, analytical method, and concentration level (if applicable).

Matrix: Soil/Sediment

Analytical Method: TAL Metals (field analysis: 6200, lab analysis: 6010) *Not Applicable*
Concentration level (if applicable): N/A *Guidance: Not Applicable*

Analyte	Project Action Limit (PAL) ¹ mg/kg	PAL Reference ¹	Project Quantitation Limit (PQL) Goal ⁴	Laboratory Quantitation Limit ²	Laboratory Detection Limit ²
Aluminum	110,000	EPA Industrial Soil RSLs*	NA	TBD	TBD
Antimony	47	EPA Industrial Soil RSLs*	50-100	TBD	TBD
Arsenic	48	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Barium	22,000	EPA Industrial Soil RSLs*	50-100	TBD	TBD
Beryllium	230	EPA Industrial Soil RSLs*	NA	TBD	TBD
Cadmium	98	EPA Industrial Soil RSLs*	50-100	TBD	TBD
Calcium	N/A	EPA Industrial Soil RSLs*	250-2500	TBD	TBD
Chromium	180,000	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Cobalt	35	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Copper	4,700	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Iron	82,000	EPA Industrial Soil RSLs*	10-100	TBD	TBD

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Analyte	Project Action Limit (PAL) ¹ mg/kg	PAL Reference ¹	Project Quantitation Limit (PQL) Goal ⁴	Laboratory Quantitation Limit ²	Laboratory Detection Limit ²
Lead	800	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Magnesium	NA	EPA Industrial Soil RSLs*	NA	TBD	TBD
Manganese	2,600	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Nickel	2,200	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Potassium	N/A	EPA Industrial Soil RSLs*	250-2500	TBD	TBD
Selenium	580	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Silver	580	EPA Industrial Soil RSLs*	50-100	TBD	TBD
Sodium	NA	EPA Industrial Soil RSLs*	NA	TBD	TBD
Thallium	1.2	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Vanadium	580	EPA Industrial Soil RSLs*	10-100	TBD	TBD
Zinc	35,000	EPA Industrial Soil RSLs*	10-100	TBD	TBD

¹ CLP laboratories use accepted analytical methods for the isolation, detection, and quantitation of specific target compounds and analytes. The CLP TCL, TAL, and their corresponding CRQL are listed in QAPP Appendix B and QAPP Appendix C, respectively.

² Links to State regulatory cleanup standards are provided in QAPP Appendix D. The PALs will ultimately be determined by the OSC but will be based in part on TCLP limits, CSEVs, and Colorado WQS.

³ Terminology is project/laboratory-specific.

⁴ XRF Detection Limit Guidelines-Low density sample types (soils, powders, liquids)

Worksheet 17 — Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)

(EPA 2106-G-05 Section 2.3.1)

Samples will be managed in accordance with SAP Worksheet 26 & 27.

Safety

All field activities will be conducted in strict accordance with an approved Health and Safety Plan (HASP), which will be developed before the start of field activities. It is anticipated that all field work can be accomplished in Level D Personal Protective Equipment (PPE) equipment. START personnel performing sampling will wear PPE appropriate to the hazard presented. At a minimum, the following guidelines should be followed: when on site steel toed-boots shall be worn; sampling gloves and eye protection should be worn. In the presence of heavy equipment including the excavator, a hard hat and hearing protection should also be worn. Field crews will be cognizant of steep slopes and uneven terrain when sampling.

Property Access and Logistics

Access to the property will be obtained and managed by the EPA before any sampling. START will have consent from all applicable property owners (on property and off-property) prior to the field sampling event.

Sample Collection

Surface and Subsurface Soil Sampling

START will navigate to sampling zones in the AOIs delineated by the OSC and collect two 20-point composite samples per sampling zone based on locations predetermined by the OSC. Aliquots will be homogenized and composited into two samples per sampling zone, one surface sample and one sub-surface sample. Aliquot locations will be shot in situ with the XRF instrument and results will be recorded as monitoring data.

Surface samples will be collected using a disposable plastic scoop. In the event that the ground is too hard for use of a disposable scoop a decontaminated stainless steel scoop will be used. Each aliquot will be placed into a zip-top bag creating a composite sample with the zone location and information on the bag in indelible ink. The sample will then be homogenized for analysis at a later time by START.

Sub-surface soil samples will be collected with a hand auger or sharp shooter shovel down to a depth of 6" bgs unless professional judgment dictates otherwise. Sub-surface soil samples are to be composited from soil cores at each location determined by the OSC. One composite will be collected from 20 flagged locations in each sampling zone at a depth of up to 6" bgs. A composite soil core sample is to be prepared which will be representative of each depth interval for every

sampling zone; i.e. each sampling zone will have 1 corresponding subsurface sample down to 6" bgs.

Sampling data will be documented in a Scribe mobile application form on an iPad or a Scribe compatible data dictionary on a Trimble GPS unit and entered into a Site-specific Scribe database for data management and reporting purposes. The Scribe database will be published to Scribe.net to allow for incorporation into EPA's geospatial viewer. A latitude and longitude will be recorded at each aliquot location per sampling zone to allow for visual representation of sampling activities on EPA's geospatial viewer. Sampling activities will be photo documented, and photos will be uploaded to EPAOSC.net to allow for incorporation into EPA's geospatial viewer.

Sample Analysis

Soil sample analysis will be performed onsite by START personnel in the START field laboratory. Surface and sub-surface soil samples will be analyzed via XRF instrumentation, with 10% of the total number of soil samples collected sent for laboratory confirmation analysis.

Sample Identification and Handling

Samples will be placed into zip top plastic bags labeled with the sample ID in indelible ink. Sample IDs will begin with the letters "BC" indicating the sample is part of the Bullion Canyon sampling event, followed by "SS" for surface soil, "SB" for subsurface soil, followed by AOI location (FP- Fireman's Park, RS- Residential, ect.), followed by a 2-digit sequential sampling number. Surface soil samples will have no further sample nomenclature. Sample collection method (grab vs. composite) will be recorded in the "Sample Collection" field in the Scribe Mobile Application.

Example: sample BCSSFP01 will indicate a surface composite soil sample collected from Fireman's Park.

Example: sample BCSBFP01 will indicate a subsurface (0-6") composite soil sample collected from Fireman's Park.

Sample cross contamination will be reduced by using disposable plastic scoops for each sample. If a stainless steel scoop is used, it will be decontaminated between samples with a brush to remove gross particulate and a nitric acid rinse, followed by a distilled water rinse. The scoop will then be allowed to gravity drain.

Samples will be analyzed for the parameters listed on Worksheet 15. In addition, requirements for the sample container, volume, preservation, and QC samples are listed on Worksheet 19 & 30 of the QAPP. Table 2 summarizes the information from Worksheet 15 and Worksheet 19 & 30.

Monitoring Data

In situ XRF monitoring locations will be captured in both the Scribe Mobile Application on the GPS enabled iPad or Scribe compatible data dictionary on the Trimble GPS and in the XRF instrument, to allow for a join of locational data with in situ results.

Monitoring Ids will consist of the following:

- 2 Digit Area ID (the same area ids used in Sample Ids)
- 2 Digit Sequential Monitoring Id
- 2 Digit Depth reference (02: 0-2", 06: 0-6")

Example: in situ monitoring location BC-01-02 will be the first monitoring location.

Sampling Logistics and Contingencies

- *Sampling Schedule Considerations*

Samples do not require any special time or climate requirements. They will be analyzed and sent to the laboratory to meet the deadlines outlined in SAP Worksheet 14 & 16.

- *Sample Information Importance and Data Variability*

The purpose of this sampling is outlined in SAP Worksheet 11, the concentrations of TAL metals and in particular lead, arsenic and zinc are being measured and are of high importance.

Soil samples for the project will be combined to create composite samples. By creating the composite samples from the independent aliquots data variability should be identifiable and minimized.

- *Potential Sampling Problems and Corrective Action*

As noted above, if soil conditions prevent the use of disposable scoops, a decontaminated stainless steel scoop will be used for sample collection.

Any changes from the planned equipment and/or methods will be documented in the field logbook.

Worksheet 18 — Sampling Locations and Methods
(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Sections 2.3.1 and 2.3.2)

Sampling Location / ID	Matrix	Depth (inches)	Type	Analyte/Analytical Group	Sampling SOP Reference ¹	Comments
BCSSFP01/BCSSFP01	Soil	surface	Composite	TAL Metals	See Worksheet 21	Surface soil
BCSBFP02/BCSBFP02	Soil	0-6	Composite	TAL Metals	See Worksheet 21	Sub surface soil

¹ Sampling SOPs references are provided in Worksheet 21.

Worksheet 19 & 30 — Sample Containers, Preservation, and Hold Times

(UFP-QAPP Manual Section 3.1.2.2)

(EPA 2106-G-05 Section 2.3.2)

Matrix	Analyte/ Analyte Group	Method/ SOP ¹	Accreditation Expiration Date	Container(s) (number, size & type per sample) ²	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround
Soil	TAL Metals	6200 (field analysis)	TBD	Zip-top baggie	Store @ < 4°C	NA	180 days	Standard
Soil	TAL Metals	6010 C (lab analysis)	TBD	XRF Cup	Store @ < 4°C	N/A	180 days	Standard

¹ Refer to the Analytical SOP References table (Worksheet 23).

² The minimum sample size is based on analysis allowing for sufficient sample for reanalysis. Additional volume is needed for the laboratory MS/MSD sample analysis.

Worksheet 20 — Field Quality Control Sample Summary

(UFP-QAPP Manual Sections 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.5)

Matrix	Analyte/Analytical Group	No. of Field Samples ¹	No. of Field Duplicates	No. of MS/MSD	No. of Field Blanks	No. of Equip. Blanks	No. of Trip Blanks	No. of Other	Total No. of Samples to Laboratory
Soil	TAL Metals (field analysis)	TBD	10% of # field samples	TBD	TBD	TBD	0	TBD	TBD
Soil	TAL Metals (lab analysis)	TBD	TBD	TBD	TBD	TBD	0	TBD	10% of # field samples

1 Samples that are collected at different depths at the same location and analyzed separately are counted as separate field samples. Even if they are taken from the same container as the parent field sample, MS/MSDs are counted separately because they are analyzed separately. If composite samples or incremental samples are collected, only the sample that will be analyzed will be included; subsamples and increments will not be listed separately.

2 Equipment blanks will be collected only if non-disposable sampling equipment is used.

Quality Assurance Assessment and Corrective Actions are found in QAPP Worksheet #28.

Worksheet 21 — Field SOPs
(UEP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

SOP Number or Reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP Option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
2006	Sampling Equipment Decontamination, 6/2011	U.S. EPA, ERT		N	SOPs available in QAPP Appendix B
2012	Soil Sampling, 6/2011	U.S. EPA, ERT		N	SOPs available in QAPP Appendix B
2049	IDW Management, 6/2011	U.S. EPA, ERT		N	SOPs available in QAPP Appendix B
G-12	Specifications and Guidance for Contaminant-Free Sample Containers, 12/1992	U.S. EPA, Office of Solid Waste and Emergency Response		N	SOPs available in QAPP Appendix B
2001	General Field Sampling Guidelines, 6/2011	U.S. EPA, ERT		N	SOPs available in QAPP Appendix B
N/A	InnovX Omega Operating Manual	InnovX		N	

Investigation Derived Waste

During sampling activities, IDW may be generated. IDW may consist of decontamination fluids, excess sampled media (e.g., soil, sediment, water, etc.), disposable sampling supplies, and PPE (e.g., Tyvek/Saranex coveralls, gloves, booties, etc.). Handling of IDW will be performed according with SOP 2049 as listed above as well as procedures described in *Management of Investigation Derived Wastes during Site Inspections (May 1991)*(QAPP Appendix S). Waste disposal for IDW will be dependent upon classification of the waste as either RCRA hazardous or RCRA nonhazardous waste.

IDW will also include waste soil generated during the XRF soil preparation process. Waste soil will be containerized in the on-site lab and returned to the site prior to demobilization. Waste soil will be added to an existing waste pile in a manner that does not create or exacerbate existing mobilization concerns.

Decontamination

General decontamination procedures are described in EPA ERT SOP #2006 Sampling Equipment Decontamination.

Decontamination will be limited to the augur/shovel/pick (tools) in the event they are used. It is anticipated that START sample collection will exclusively use dedicated/disposable sampling tools. Tool decontamination will consist of initial brushing to remove gross particulate, a rinse with Alconox and/or nitric acid, followed by a distilled water rinse.

Worksheet 22 — Field Equipment Calibration, Maintenance, Testing, and Inspection

(UFP-QAPP Manual Section 3.1.2.4)

(EPA 2106-G-05 Section 2.3.6)

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title or Position of Responsible Person	Verification	SOP Reference ¹
Sampling Tools (Disposable Scoops)	NA	NA	NA	Visually inspect for obvious defects or broken parts	Prior to use	NA	Replace	Field personnel	WAM/COR	NA
Metal sampling equipment as necessary (trowels)	NA	Clean prior and after each use	NA	Visually inspect for cleanliness	Prior to use	Should be covered from previous decontamination procedure	Perform decontamination procedure again as needed	Field personnel	NA	Metal sampling equipment as necessary (trowels)
GPS	NA	Check Battery	NA	Visually inspect for damage, ensure proper battery function, ensure receiver is able to obtain satellite reception	Prior to use	Proper battery function, satellite reception	Refer to instrument SOP	Field personnel	NA	NA
X-Ray Fluorescence (XRF)	Check factory calibration with known standards	Check battery	Calibration check	Visually inspect for external damage (e.g., perforated lens, etc.)	Refer to instrument SOP	Refer to instrument SOP	Refer to instrument SOP	Field personnel	WAM/COR	1707

¹ Refer to Field SOPs (Worksheet 21) and Analytical SOPs (Worksheet 23).

Worksheet 23 — Analytical SOPs
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

Lab SOP Number ¹	Title, Revision Date, and/or Number and URL (if available)	Screening or Definitive Data	Matrix/Analytical Group	SOP Option or Equipment Type	Modified for Project? (Y/N)
TBD	Method 6200 FIELD PORTABLE X-RAY FLUORESCENCE SPECTROMETRY FOR THE DETERMINATION OF ELEMENTAL CONCENTRATIONS IN SOIL AND SEDIMENT http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/6200.pdf	Screening	Soil, sediment	TBD	N
TBD	METHOD 6010C INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROMETRY (ICP-AES), 11/2000, http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/6010c.pdf	Definitive	Soil, sediment, debris, aquatic animal tissue, air/metals (no mercury)	ICP-AES	N

Worksheet 24 — Analytical Instrument Calibration

(UFP-QAPP Manual Section 3.2.2)

(EPA 2106-G-05 Section 2.3.6)

As stated in Worksheet 22, WESTON field personnel are responsible for the calibration of WESTON and sub-contractor provided analytical field equipment. Documented and approved procedures will be used for calibrating measuring and testing equipment. Widely accepted procedures, such as those published by U.S. EPA and ASTM, or procedures provided by manufacturers in equipment manuals will be adopted.

The responsibility for the calibration of laboratory equipment rests with the selected laboratories. Each type of instrumentation and each U.S. EPA-approved method have specific requirements for the calibration procedures, depending on the analytes of interest and the sample medium. The calibration procedures and frequencies of the equipment used to perform the analyses will be in accordance with requirements established by the U.S. EPA. The laboratory QA manager will be responsible for ensuring that the laboratory instrumentation is maintained in accordance with specifications. Individual laboratory SOPs will be followed for corrective actions and preventative maintenance frequencies. Laboratory quality control, calibration procedures, corrective action procedures, and instrument preventative maintenance will be included in an addendum to this QAPP once the laboratories have been selected for each of the TBA sites. Items may include, but are not limited to those identified in the table below.

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Title/Position Responsible for CA	SOP Reference ¹
Portable XRF Analyzer	Refer to Worksheet 22	Refer to Worksheet 22	Refer to Worksheet 22	Refer to Worksheet 22	Refer to Worksheet 22	1707
ICP-AES	See 6010C	Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verifications. Upper range within 10%. New upper range limits should be determined whenever a significant change in instrument response or every six months. Low-level continuing calibration verification (LLCCV) standard with 30%.	Initial and continuing calibration verification within $\pm 10\%$ of upper range true values and $\pm 30\%$ LLCCV true values.	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/Analyst	6010C

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Title/Position Responsible for CA	SOP Reference ¹
ICP/ ICP-MS	See 6010C, 6020A, ISM01.3	Calibration and initial calibration verification after instrument set up, then daily; continuing calibration verification 10% or every 2 hours, whichever is more frequent	Calibration $r^2 > 0.995$; initial and continuing calibration verification within $\pm 20\%$ of true values	Inspect system; correct problem; re-run calibration and affected samples	Lab Manager/ Analyst	6010C, 6020A, ISM01.3

Worksheet 26 & 27 — Sample Handling, Custody, and Disposal

(UEP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Manual Section 2.3.3)

Examples of field form (QAPP Appendix F), chain-of-custody (QAPP Appendix G), and sample label and custody seal (QAPP Appendix H) documentation are in the QAPP. SOPs for sample handling are identified below and are located in QAPP Appendix I.

Sampling Organization: WESTON
Laboratories: TBD

Note –The OSC will review and approve the SAP prior to proceeding with lab procurement. Therefore this information will not be available until the lab procurement has been finalized.

Method of sample delivery (shipper/carrier): TBD
Number of days from reporting until sample disposal: TBD

Activity	Organization and Title or Position of Person Responsible for the Activity	SOP Reference
Sample Labeling	START Field Personnel	QAPP Appendix I, SOP G-1 & G-3
Chain-of-Custody Form Completion	START Field Personnel	QAPP Appendix I, SOP G-8
Sample Packaging	START Field Personnel	QAPP Appendix I, SOP G-9
Shipping Coordination	START Field Personnel	QAPP, Appendix I, SOP G-9
Sample Receipt, Inspection, & Log-in	Laboratory Sample Custodian	Laboratory SOP
Sample Custody and Storage	Laboratory Sample Custodian /Laboratory Analytical Personnel	Laboratory SOP
Sample Disposal	START Field Personnel/Laboratory Sample Custodian /Laboratory Analytical Personnel	QAPP Appendix I, SOP G-1 & G-3 Laboratory SOP

Supplies and consumables can be received at a WESTON office, U.S. EPA Warehouse or at a site. When supplies are received at a WESTON office or U.S. EPA Warehouse, the PM or PTL will sort the supplies according to vendor, check packing slips against purchase orders, and inspect the condition of all supplies before the supplies are accepted for use on a project. If the supplies do not meet the acceptance criteria, deficiencies will be noted on the packing slip and purchase order. The item will then be returned to the vendor for replacement or repair. Procedures for receiving supplies and consumables in the field are similar to those described above. Upon receipt, items will be inspected by the WESTON PM or PTL against the acceptance criteria. Any deficiencies or problems will be noted in the field logbook, and deficient items will be returned for immediate replacement.

Worksheet 36 — Data Validation Procedures

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Data Validator: WESTON

Analytical Group/Method	Data Deliverable Requirements	Analytical Specifications	MPC	Percent of Data Packages to be Validated	Percent of Raw Data Reviewed	Percent of Results to be Recalculated	Validation Procedure	Validation Code ¹	Electronic Validation Program/Version
TAL Metals by laboratory analysis	Validation Memo	TAL Metals	Worksheets 11, 12, 19 & 30	10%	10%	10%	Consistent with NFG	S2aVM	NA
TAL Metals by XRF analysis	Validation Database	TAL Metals		100%	100%		Consistent with NFG		

¹ Validation Codes are provided in QAPP Appendix M.

Validation will be performed on all laboratory analytical data unless a defined quantity or percentage of samples is identified by the U.S. EPA in the Technical Direction Document or during the project scoping meeting on a project-specific basis. Project validation criteria as per QAPP Worksheets 12, 15, 19 & 30, 28, and 36, and cited EPA SW-846 methodology will be used. WESTON-contracted laboratory data packages will be verified and validated using a Stage 2A validation, as described in the *EPA Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009) (QAPP Appendix J) unless otherwise specified by the U.S. EPA WAM/COR during the development of the DQOs. Validation Qualifiers will be applied using the following hierarchy: Region 8 UFP-QAPP for Removal Actions and Emergency Responses; the site-specific SAP, and/or QAPP; *EPA National Functional Guidelines for Organic Data Review* (QAPP Appendix K); *EPA National Functional Guidelines for Inorganic Data Review* (QAPP Appendix L); EPA Publication SW-846; and the laboratory-specific SOP. Methods for which no data validation guidelines exist will be validated following the guidance deemed most appropriate by the data validator.

The data validator will receive all laboratory packages and analytical results electronically. Additionally, the validator will be required to submit final validation reports via PDF format and must provide an annotated laboratory analytical result EDD with applicable data validation qualifiers (QAPP Appendix M) identified in the site-specific SAP, and/or QAPP, and/or result value modifications. The Delegated QA Manager will use EPA document *Using Qualified Data to Document an Observed Release and Observed Contamination* (July 1996) to aid in determining the use of qualified data to document all observed release and observed contamination by chemical analysis under U.S. EPA's HRS. Approved data will be released by the Delegated QA Manager for reporting.

Worksheet 36 — Data Validation Procedures

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

QAPP Worksheet 35 describes the issue resolution process and the individual responsible for conveying results to data users. For issues internal to the laboratory, the laboratory PM will be the responsible party for data resolution issues and will be responsible for conveying this information to the Delegate QA Manager or delegated authority. For external laboratory data and quality issues, the Delegated QA The QA Manager or delegated authority will provide issue resolution information and will be the responsible party for conveying this information to data users. For quality documents, reports, and field information, the Delegated QA Manager, delegated authority, or other persons identified in the table in QAPP Worksheet 35 will be responsible for issue resolutions of such items and will be the responsible party for conveying that information to data users.

FIGURES

ATTACHMENTS

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ATTACHMENT A

Crosswalk

ATTACHMENT B

Site-Specific Data Management Plan (SSDMP)
