

Atlantic Richfield Company

317 Anaconda Road
Butte, MT 59701
Main (406) 782-9964
Fax (406) 782-9980

August 11, 2015

CERTIFIED – RETURN RECEIPT REQUESTED

Mr. Charlie Coleman
U.S. EPA, Region VIII
Federal Building, 10 West 15th Street
Helena, MT 59626-0096

Mr. Joel Chavez
DEQ
Remediation Division
P.O. Box 200901
Helena, Montana 59620-0901

RE: ***Community Soils Operable Unit (CS OU) Final Residential Soils/Dust Remedial Action Work Plan/Final Design Report (RAWP/FDR)***

Dear Gentlemen:

Enclosed for your review, please find 2 copies and 2 CDs of the *Community Soils Operable Unit (CS OU) Final Residential Soils/Dust Remedial Action Work Plan/Final Design Report (RAWP/FDR)*. This RAWP/FDR incorporates Agency comments to the Draft Final submittal received on July 10, 2015.

If anyone on the cc list would like a hard copy document in addition to the CD they have been provided, please let me know. If you have questions or concerns regarding this submittal, please do not hesitate to call me at (406) 723-1832.

Sincerely,

Luke Pokorny
Project Manager

cc: Julie Dalsoglio/EPA (CD)
Joe Vranka/EPA (CD)
Andy Lensink/EPA (CD)
Katherine Haque-Hausrath/DEQ (CD)
Gunner Emilsson/CDM (CD)
Ken Brockman/USBR (1 Hard Copy and 1 CD)
Connie Ternes-Daniels/ADLC (CD)
Carl Nyman/ADLC (CD)
Ron Halsey/Atlantic Richfield (CD)
Cord Harris/Atlantic Richfield (CD)

Terry Moore/Atlantic Richfield (CD)
Nathan Block/Atlantic Richfield (CD)
John Davis/PRRL (CD)
Don Booth/Booth Consulting (CD)
Shawn Bisch/Pioneer (1 Hard Copy and 1 CD)
Jesse Schwarzrock/Pioneer (1 Hard Copy and 1 CD)

File: MiningSharePoint@bp.com

ANACONDA SMELTER NPL SITE
COMMUNITY SOILS OPERABLE UNIT

Final

Residential Soils/Dust
Remedial Action Work Plan/Final Design Report
(RAWP/FDR)

Atlantic Richfield Company

August 7, 2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Ref: 8MO

July 10, 2015

Mr. Luke Pokorny
Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Dear Luke:

EPA, in consultation with DEQ, approves, with comment, Atlantic Richfield's *Community Soils Operable Unit (CSOU) Draft Final Residential Soils and Attic Dust Remedial Action Work Plan/Final Design Report (RAWP/FDR), dated May 1, 2015.* Previous Agency comments have been adequately addressed. Please revise the RAWP/FDR and QAPP as final documents. EPA will proceed to develop and issue an UAO in order to initiate the remedial action this fiscal year.

If you have any questions, please give me a call.

Sincerely,

Charles Coleman
Anaconda Project Manager

Enclosure

cc: Andy Lensink, ENF-L
Joel Chavez, DEQ
Katherine-Haque-Hausrath, DEQ
Ken Brockman, BOR
Gunnar Emilsson, CDM
Connie Daniels, ADL

AR: Cord Harris, AR
Shannon Dunlap, AR
Jill Kelley, AR
John Davis, PRR
Kevin Bethke, TREC
Duane Logan, PTS

Comments to the
Residential Soils and Interior Dust Remedial Action Work Plan/Final Design Report
Community Soils Operable Unit
Anaconda Smelter NPL Site

General Comments

Overall, all of the discussion items previously provided to the text have been adequately addressed.

Specific Comments

Page 32, Section 5.7.2 Design and Implementation of Attic Dust RA, first paragraph beneath the four bulleted items, insert the following to the first sentence (new text in bold font: "If above qualifications are met, attic dust samples will be collected **(see Section 5.6.2)**."

Figure 6, Yard Sampling Flow Chart for Component Previously Remediated at 0" – 6" depth. This flow chart specifies sampling at a depth of 2 to 6 inches, and analyzing the sample for arsenic only. It is unclear why this would be done, for presumably there is Type A material to a depth of 6 inches for these components.

Figure 6, Yard Sampling Flow Chart for Component Previously Remediated at 0" – 12" depth. Similar question as above. This flow chart specifies sampling at a depth of 2 to 6 inches and to 12 inches, and analyzing the sample for arsenic only. It is unclear why this would be done, for presumably there is Type A material to a depth of 12 inches for these components.

Construction Quality Assurance Plan and Technical Specifications. Although the titles of these appendices indicate that both soil and dust remedial actions are addressed by these plans and specifications, dust is not discussed at all. At a minimum, the transport and disposal of collected dust and associated remedial action-derived wastes should be addressed.

Drawings, Sheet 6. The Agencies suggest revising this sheet to include "Earthen Driveways and Alleys Removal/Replacement Details."

Quality Assurance Project Plan. Figure 1 (Organization Chart) does not identify individuals below the level of the ARCO QA manager. The name of contractor staff should be included in the final version of the QAPP, to be provided prior to the start of sampling.

Quality Assurance Project Plan. Page 9, Section 2.4.2 – Measurement Performance Criteria for Data. Some of the PARCC parameters can be calculated by the analytical laboratory, but others will need to be calculated by ARCO or its technical consultant. The QAPP should identify who will make the PARCC calculations. Furthermore, this section should describe how this information will be summarized and reported to the Agencies.

Quality Assurance Project Plan Section 3.1.2.1 - Attic Dust Sampling Eligibility. The first paragraph in this section explains how attics are chosen for sampling and states that "the CS OU attic dust sampling design focuses on those properties with existing screening level data in soil showing lead concentrations equal to or greater than 400 ppm". This decision rule may be flawed if the soil lead concentrations in a yard are less than 400 mg/kg because the home owner (or a previous owner) did some level of landscaping or remediation. In these cases the attics could still contain significant contamination. Furthermore, this decision logic assumes that attics would only show high contaminant levels if the soil in the same yard had high contaminant levels. What about properties that have low soil lead concentrations (less than 400 mg/kg) but are surrounded by yards soil having greater than 400 mg/kg lead? It should be demonstrated that this decision rule does not overlook attics with high contaminant levels when soil contaminant levels are low.

Quality Assurance Project Plan Section 5 – Data Review and Usability. The discussion in this section (and specifically in Section 5.2.2) is missing some key indicators of data quality and project-specific data usability.

a. The section does not include the performance of an independent validation of the laboratory data using EPA National Functional Guidelines. This is required of EPA contractors and it is assumed that this would also be a requirement of PRPs.

b. This section also does not discuss evaluating the data for project usability. Specifically, the data should be evaluated against the DQOs.

c. The section does not discuss the assessment of the PARCC parameters, which are another indication of data quality.

End of comments.

Comments to the
Residential Soils and Interior Dust
Remedial Action Work Plan/Final Design Report
Community Soils Operable Unit
Anaconda Smelter NPL Site

General Comments

Overall, all of the discussion items previously provided to the text have been adequately addressed.

> ***Response:*** *Comment Noted.*

Specific Comments

Page 32, Section 5.7.2 Design and Implementation of Attic Dust RA, first paragraph beneath the four bulleted items, insert the following to the first sentence (new text in bold font: "If above qualifications are met, attic dust samples will be collected **(see Section 5.6.2)**."

> ***Response:*** *The requested text has been inserted into the final document.*

Figure 6, Yard Sampling Flow Chart for Component Previously Remediated at 0" – 6" depth. This flow chart specifies sampling at a depth of 2 to 6 inches, and analyzing the sample for arsenic only. It is unclear why this would be done, for presumably there is Type A material to a depth of 6 inches for these components.

> ***Response:*** *In the Draft Final RAWP/FDR, soil within the 2 to 6 inch depth interval in components that had been previously remediated to a depth of 6 inches, was planned to be sampled and analyzed for arsenic so that the area-weighted average for the entire yard could be calculated for that depth interval. This approach is consistent with the Data Quality Objectives and acknowledges the clean soil in components previously remediated.*
>
> *However, an alternative approach is proposed for the Final RAWP/FDR, which involves applying an average arsenic concentration for clean soil placed in all components that have been previously remediated to a depth of 6 inches. The average arsenic concentration applied in these components is based on the average arsenic concentration measured in the 100 Type A borrow soil samples collected during the previous CSOU Remedial Action, which is 19.1 mg/kg (see Table 1). This is a reasonable approach that will significantly reduce the number of samples collected/analyzed, reduce the time required for field personnel to collect samples, and consequently allow more residents to be sampled over a given period of time.*

TABLE 1: Type A Borrow Soil Arsenic Concentration (2005 - 2010 CS OU RA)

SAMPLE ID	Arsenic (mg/kg)	Comment
05 - CMOU - 0505 - 001	29.3	
05 - CMOU - 0628 - 002	22.5	
05 - CMOU - 0628 - 003	11.3	
05 - CMOU - 0628 - 004	24.3	
05 - CMOU - 0628 - 005	19.3	
05 - CMOU - 0628 - 006	17.0	
05 - CMOU - 0628 - 007	13.3	
05 - CMOU - 0628 - 008	15.6	
05 - CMOU - 0628 - 009	22.9	
05 - CMOU - 0713 - 010	37.6	
05 - CMOU - 0713 - 011	12.3	
05 - CMOU - 0713 - 012	20.9	
05 - CMOU - 0713 - 013	17.0	
05 - CMOU - 0802 - 014	17.2	
05 - CMOU - 0802 - 015	12.8	
05 - CMOU - 0811 - 016	10.2	
05 - CMOU - 0811 - 017	13.6	
05 - CMOU - 0811 - 018	14.6	
05 - CMOU - 0811 - 019	22.4	
05 - CMOU - 0811 - 020	20.0	
05 - CMOU - 0811 - 021	26.7	
05 - CMOU - 0811 - 022	17.5	
05 - CMOU - 0811 - 023	26.7	
05 - CMOU - 0811 - 024	18.9	
05 - CMOU - 0811 - 025	19.0	
06 - CMOU - 0418 - 001	33.5	
06 - CMOU - 0418 - 002	31.3	
06 - CMOU - 0418 - 003	25.9	
06 - CMOU - 0418 - 004	21.3	
06 - CMOU - 0418 - 005	15.5	
06 - CMOU - 0419 - 006	4.9	
06 - CMOU - 0419 - 007	6.4	
06 - CMOU - 0419 - 008	4.9	
06 - CMOU - 0419 - 009	15.7	
06 - CMOU - 0420 - 010	9.7	
06 - CMOU - 0420 - 011	31.4	
06 - CMOU - 0420 - 012	6.8	
06 - CMOU - 0613 - 013	22.3	
06 - CMOU - 0613 - 014	17.2	
06 - CMOU - 0613 - 015	16.5	
06 - CMOU - 0613 - 016	16.1	
06 - CMOU - 0629 - 017	15.4	

06 - CMOU - 0629 - 018	17.6	
06 - CMOU - 0629 - 019	28.5	
06 - CMOU - 0629 - 020	27.0	
06 - CMOU - 0807 - 021	20.1	
06 - CMOU - 0807 - 022	9.9	
06 - CMOU - 0807 - 023	13.4	
06 - CMOU - 0807 - 024	20.5	
06 - CMOU - 0807 - 025	9.6	
06 - CMOU - 0807 - 026	14.4	
06 - CMOU - 0807 - 027	15.5	
06 - CMOU - 0807 - 028	10.5	
06 - CMOU - 0807 - 029	17.2	
06 - CMOU - 0807 - 030	19.8	
TYPE A-0805-CS-001	4.0	1/2 Detection Limit
SCREENED A-0805-CS-001	8.4	
TYPE A-0814-001	10.6	
TYPE A-0814-002	16.9	
TYPE A-0814-003	16.2	
TYPE A-0814-004	32.5	
TYPE A-0814-005	40.6	
TYPE A-0814-006	16.6	
TYPE A-0814-007	18.8	
TYPE A-0814-008	21.2	
TYPE A-0814-009	32.1	
TYPE A-0814-010	12.9	
09-TYPEA-1008-001 (Screened)	21.1	
09-TYPEA-1009-002 (Screened)	22.4	
09-TYPEA-1010-003 (Screened)	16.0	
09-TYPEA-1012-004 (Screened)	25.2	
09-TYPEA-1016-001 (UnScreened)	17.7	
09-TYPEA-1016-002 (UnScreened)	16.5	
09-TYPEA-1016-003 (UnScreened)	4.0	1/2 Detection Limit
09-TYPEA-1016-004 (UnScreened)	29.5	
09-TYPEA-1016-005 (UnScreened)	28.6	
09-TYPEA-1016-006 (UnScreened)	11.0	
09-TYPEA-1104-001	28.8	
09-TYPEA-1105-002	23.7	
09-TYPEA-1106-003	22.9	
09-TYPEA-1106-004	24.1	
09-TYPEA-1105-005	27.0	
09-TYPEA-1105-006	4.0	1/2 Detection Limit
09-TYPEA-1105-007	14.3	
09-TYPEA-1105-008	19.6	
09-TYPEA-1105-009	22.6	
09-TYPEA-1105-010	31.6	
09-TYPEA-1105-011	21.8	
10-TYPEA-0121-012	11.1	
10-TYPEA-0121-013	23.8	

10-TYPEA-0121-014	22.0	
10-TYPEA-0121-015	32.8	
10-TYPEA-0121-016	22.6	
10-TYPEA-0121-017	12.1	
10-TYPEA-0121-018	20.5	
10-TYPE B CS-1020-001	3.0	1/2 Detection Limit
10-TYPE B CS-1020-002	3.0	1/2 Detection Limit
10-TYPE A CS-1020-003	23.7	
10-TYPE A CS-1109-001	49.6	
10-TYPE A CS-1109-002	23.4	
COUNT	**100**	
AVERAGE	**19.1**	

Figure 6, Yard Sampling Flow Chart for Component Previously Remediated at 0" – 12" depth. Similar question as above. This flow chart specifies sampling at a depth of 2 to 6 inches and to 12 inches, and analyzing the sample for arsenic only. It is unclear why this would be done, for presumably there is Type A material to a depth of 12 inches for these components.

Response: *In the Draft Final RAWP/FDR, soil within the 2 to 6 inch and the 6 to 12 inch depth intervals in components that had been previously remediated to a depth of 12 inches, was planned to be sampled and analyzed for arsenic so that the area-weighted average for the entire yard could be calculated for those depth intervals. This approach is consistent with the Data Quality Objectives and acknowledges the clean soil in components previously remediated.*

However, an alternative approach is proposed for the Final RAWP/FDR, which involves applying an average arsenic concentration for clean soil placed in all components that have been previously remediated to a depth of 12 inches. The average arsenic concentration applied in these components is based on the average arsenic concentration measured in the 100 Type A borrow soil samples collected during the previous CSOU Remedial Action, which is 19.1 mg/kg (see Table 1 above). This is a reasonable approach that will significantly reduce the number of samples collected/analyzed, reduce the time required for field personnel to collect samples, and consequently allow more residents to be sampled over a given period of time.

Construction Quality Assurance Plan and Technical Specifications. Although the titles of these appendices indicate that both soil and dust remedial actions are addressed by these plans and specifications, dust is not discussed at all. At a minimum, the transport and disposal of collected dust and associated remedial action-derived wastes should be addressed.

Response: *Text addressing transport and disposal of attic dust remedial action-derived waste has been inserted into the final documents.*

Drawings, Sheet 6. The Agencies suggest revising this sheet to include "Earthen Driveways <u>and Alleys</u> Removal/Replacement Details."

> ***Response:*** *The title of Sheet No. 6 has been modified to include removal in alleys, and the Detail No. 11 reference has been modified to include alley replacement.*

Quality Assurance Project Plan. Figure 1 (Organization Chart) does not identify individuals below the level of the ARCO QA manager. The name of contractor staff should be included in the final version of the QAPP, to be provided prior to the start of sampling.

> ***Response:*** *The technical consultants responsible for the various quality assurance roles have not been identified, and are pending Atlantic Richfield's procurement process. The QA Organization Chart will be updated accordingly, and provided to the agencies prior to the start of sampling.*

Quality Assurance Project Plan. Page 9, Section 2.4.2 – Measurement Performance Criteria for Data. Some of the PARCC parameters can be calculated by the analytical laboratory, but others will need to be calculated by ARCO or its technical consultant. The QAPP should identify who will make the PARCC calculations. Furthermore, this section should describe how this information will be summarized and reported to the Agencies.

> ***Response:*** *The QAPP has been modified to indicate that a technical consultant, who is independent from the sampling consultant, will perform the Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC) calculations. The calculations and related QA/QC information will be summarized and reported to the Agencies in each annual Data Summary Report (DSR).*

Quality Assurance Project Plan Section 3.1.2.1 - Attic Dust Sampling Eligibility. The first paragraph in this section explains how attics are chosen for sampling and states that "the CS OU attic dust sampling design focuses on those properties with existing screening level data in soil showing lead concentrations equal to or greater than 400 ppm". This decision rule may be flawed if the soil lead concentrations in a yard are less than 400 mg/kg because the home owner (or a previous owner) did some level of landscaping or remediation. In these cases the attics could still contain significant contamination. Furthermore, this decision logic assumes that attics would only show high contaminant levels if the soil in the same yard had high contaminant levels. What about properties that have low soil lead concentrations (less than 400 mg/kg) but are surrounded by yards soil having greater than 400 mg/kg lead? It should be demonstrated that this decision rule does not overlook attics with high contaminant levels when soil contaminant levels are low.

> ***Response:*** *Per the current residential soils and attic dust design, Atlantic Richfield is obligated to actively pursue Access Agreements from residences with existing screening-level lead data in soil above 400 ppm. These Access Agreements will include a request for access to sampling attics as well as soil; thus, these attics are targeted simply by association, not as a decision rule. Atlantic Richfield recognizes that other attics may*

contain contamination; consequently, any resident who is not incidentally targeted for attic dust sampling may request sampling of their attic dust.

Quality Assurance Project Plan Section 5 – Data Review and Usability. The discussion in this section (and specifically in Section 5.2.2) is missing some key indicators of data quality and project-specific data usability.

a. The section does not include the performance of an independent validation of the laboratory data using EPA National Functional Guidelines. This is required of EPA contractors and it is assumed that this would also be a requirement of PRPs.

b. This section also does not discuss evaluating the data for project usability. Specifically, the data should be evaluated against the DQOs.

c. The section does not discuss the assessment of the PARCC parameters, which are another indication of data quality.

Response: *The Quality Assurance Project Plan was initially developed presuming that completing the Level A/B Checklist only would be acceptable for verifying usability of the data. Consistent with Response to Comment No. 7 above, the QAPP has been modified to indicate that a qualified technical consultant, who is independent from the sampling consultant, will be responsible for reviewing and validating the data per the EPA National Functional Guidelines and the project Data Quality Objectives (DQOs).*

End of comments.

ANACONDA SMELTER NPL SITE
COMMUNITY SOILS OPERABLE UNIT

Final

Residential Soils/Dust
Remedial Action Work Plan/Final Design Report
(RAWP/FDR)

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

Pioneer Technical Services, Inc.
P. O. Box 3445
Butte, Montana 59702

August 7, 2015

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LIST OF APPENDICES

REVISION SUMMARY

Revision No.	Author	Version	Description	Date
Rev 0	Jesse Schwarzrock	Draft	Issued for Atlantic Richfield Review	January 14, 2015
Rev. 1	Shawn Bisch	Draft	Issued for Atlantic Richfield Review	January 28, 2015
Rev. 2	Shawn Bisch	Draft	Issued for Atlantic Richfield Review	February 2, 2015
Rev. 3	Shawn Bisch	Draft	Issued for Agency Review	February 18, 2015
Rev. 4	Shawn Bisch	Draft	Issued for Atlantic Richfield Review	April 1, 2015
Rev. 5	Jesse Schwarzrock	Draft Final	Issued for Agency Review	May 1, 2015
Rev. 6	Jesse Schwarzrock	Final	Issued for Agency Review	August 7, 2015

LIST OF ACRONYMS

ADLC	Anaconda-Deer Lodge County
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ARWW&S	Anaconda Regional Water, Waste and Soils
Atlantic Richfield	Atlantic Richfield Company
AWA	area-weighted average
bgs	below ground surface
BMP	Best Management Practice
CCR	Construction Completion Report
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CPMP	Community Protective Measures Program
CQAP	Construction Quality Assurance Plan
CS	Community Soils
DEQ	Montana Department of Environmental Quality
DPS	Development Permit System
DSR	Data Summary Report
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
ft^2	square feet
GIS	Geographic Information System
GUS	General Utility and Services
HEPA	High-Efficiency Particulate Air
IC	Institutional Control
ICIAP	Institutional Controls Implementation and Assurance Plan
ISWP	Individual Site Work Plan
LaMP	Laboratory Management Program
MSU	Montana State University
NPL	National Priorities List
OU	Operable Unit
PA	Programmatic Agreement
PEL	Permissible Exposure Limit
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAO	Remedial Action Objective
RAWP/FDR	Remedial Action Work Plan/Final Design Report
RD	Remedial Design
RDU	Remedial Design Unit
RFC	Request for Change

RFI	Request for Information
RI	Remedial Investigation
ROD	Record of Decision
RRU	Reclamation Research Unit
SAP	Sampling and Analysis Plan
SPA	Second Programmatic Agreement
SPAOD	Superfund Planning Area Overlay District
SSHASP	Site-Specific Health and Safety Plan
WMA	Waste Management Area
XRF	X-ray Fluorescence
$\mu g/ft^2$	microgram per square foot

1.0 INTRODUCTION

This Community Soils Operable Unit (CS OU) Residential Soils/Attic Dust Remedial Action Work Plan/Final Design Report (RAWP/FDR) will replace the original *Final Community Soils Operable Unit (CS OU) Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* (Atlantic Richfield Company, 2002a).

This RAWP/FDR was developed in response to the U. S. Environmental Protection Agency's (EPA) and Montana Department of Environmental Quality (DEQ) (the Agencies) 2013 CS OU *Record of Decision (ROD) Amendment* (CS OU ROD Amendment), which amended the original 1996 CS OU ROD. The CS OU ROD Amendment (EPA/DEQ, 2013) added a lead action level for residential soils (in addition to the pre-existing arsenic action level) as well as lead and arsenic action levels for attic dust.

This RAWP/FDR details both lead and arsenic sampling and remedial action (RA) applicable to residential soils and attic dust within the Anaconda-Deer Lodge County (ADLC) Superfund Planning Area Overlay District (SPAOD, aka. Superfund Planning District – [Figure 1]). This RAWP/FDR addresses lead in residential soils RA on a yard component-specific (e.g., front yard, back yard, garden, etc.) basis and arsenic in soils RA based primarily on area-weighted average (AWA) calculations. Sampling and RA for both arsenic and lead in residential soils will extend to a maximum depth of 12 inches (24 inches in vegetable and flower gardens). Any visible mining and smelting-related waste that may be encountered while performing RA in residential areas will be addressed as miscellaneous waste. For consistency, the Agencies have determined that visual waste materials located throughout the site will be addressed as miscellaneous wastes in accordance with the selected remedy identified in the Anaconda Regional Water, Waste and Soils (ARWW&S) OU ROD (EPA, 1998). The ARWW&S OU remedy generally requires that miscellaneous waste materials located outside of a designated Waste Management Area (WMA) must be removed and consolidated within an appropriate disposal facility approved by EPA.

As part of this RAWP/FDR the following are attached as appendices:

- Appendix A: List of Properties within the CS OU with Screening Level and Enforcement Level (Opportunity) Lead Concentrations in Soil $\geq$ 400 ppm Lead;
- Appendix B: Residential Soils/Dust Construction Quality Assurance Plan (CQAP);
- Appendix C: Technical Specifications;
- Appendix D: Standard Drawings;
- Appendix E: Residential Soils/Dust Quality Assurance Project Plan (QAPP);
- Appendix F: CS OU Status Maps (Lead Levels);
- Appendix G: CS OU Performance Standards;
- Appendix H: Dust Sampling Residential Occupant Questionnaire;
- Appendix I: Suspected Lead Paint Notification Letter; and
- Appendix J: Sample Results Letters.

1.1 Purpose and Scope

The purpose of this RAWP/FDR is to address arsenic and lead impacts in residential soils and attic dust within the CS OU area of concern (ADLC SPAOD). This investigation will supplement the original CS OU sampling investigation and RA activities that focused on arsenic concentrations in residential soils by adding a lead action level for residential soils and also adding lead and arsenic action levels for attic dust. This RAWP/FDR does not address residential yard components that have previously been remediated to a depth of 12 inches or greater.

1.1.1 CS OU Focus Area

The conceptual model applicable to residential soils within the CS OU presumed that contamination was primarily due to aerial emissions from the Anaconda Smelter stack. According to this model, the highest concentrations of constituents were expected to be observed at or near the ground surface; consequently, the Remedial Investigation (RI) sampling activities focused on defining contamination levels in surface soils (0 to 2-inch depth interval). The CS OU Focus Areas were established by kriging the spatial, surficial data that had been collected throughout the CS OU during the RI sampling efforts.

Development of the CS OU Focus Areas is described in detail in the *Final Community Soils Operable Unit (CS OU) Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* (Atlantic Richfield Company, 2002a). In summary, the CS OU Focus Areas consisted of the following:

- 792 residences within several city blocks located east of Main Street in Anaconda;
- 48 alleys located east of Main Street in Anaconda;
- 11 residences located in the northern portion of Opportunity; and
- 190 residences located throughout the Regional Area (rural area surrounding Anaconda to the north, east and south).

In addition to potential contamination caused by aerial emissions, the regional Focus Area included residences located in close proximity to Silver Bow Creek (Fluvial Area Remedial Design Unit [RDU] 9) where residential soils may have been impacted by fluvial deposition of tailings/mine wastes via historic flooding and/or irrigation.

Each of the 993 residences and 48 alleys itemized above were specifically listed in the *Final Community Soils Operable Unit (CS OU) Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* (Atlantic Richfield Company, 2002a) and were required to be sampled under the *Final Residential Soils Sampling and Analysis Plan* (Atlantic Richfield Company, 2002b). Additionally, any residence located in Anaconda, Opportunity or the Regional Area not listed in the *Final Community Soils Operable Unit (CS OU) Residential Soils*

Remedial Action Work Plan/Final Design Report (RAWP/FDR) (Atlantic Richfield Company, 2002a) could request soil sampling of their residential property at no charge to the homeowner.

A large percentage of residential yards located within the Anaconda Focus Area were sampled in 2002 and 2003 (first 2 years of comprehensive RD sampling). After the 2002 and 2003 arsenic data were summarized, validated and reported to the Agencies in the *Final Residential Soils Sampling Data Summary Report (DSR)* (Atlantic Richfield Company, 2004), the data were evaluated by the Montana State University (MSU) Reclamation Research Unit (RRU) to verify that the conceptual model applicable to the site was accurate (i.e., due to smelter aerial emissions, the highest arsenic concentrations were expected to be found in surface soils, with decreasing concentrations at depth) and to verify that the majority of the contamination was contained within the Anaconda Focus Areas. The results of this evaluation are presented in the Technical Memorandum titled *Review of Remedial Action Summary Table for 205 Residences in Anaconda, Montana, Sampled Through October 2003* (MSU/RRU, 2003). The Technical Memorandum concluded that arsenic contamination was more widespread and scattered in East Anaconda than originally predicted by the kriging model used during the RI to identify the original Focus Area.

On January 20, 2004, the Agencies submitted the *Community Soils Operable Unit, Residential Soil Remedial Action Proposed Remedy Modification* (EPA, 2004) to Atlantic Richfield Company (Atlantic Richfield), which recommended expanding the Focus Area in Anaconda to include all residences located east of Main Street (based on conclusions presented in the MSU RRU Technical Memorandum). On February 4, 2004, Atlantic Richfield submitted a letter to the Agencies agreeing to send a cover letter and stamped return post card to all residents located east of Main Street in Anaconda (but outside the original Focus Area) encouraging residents to request sampling of their property. The Agencies responded on February 24, 2004, indicating that the letter and post card were approved to adequately address residences within the expanded Focus Area. The expanded Focus Area is shown on Figure 1.

During April 2004, Atlantic Richfield generated a list of all residents located east of Main Street in Anaconda (but outside the original Focus Area) and sent letters with stamped return post card encouraging residents to request sampling of their property. Additionally in 2008, Atlantic Richfield completed a comprehensive door-to-door effort to encourage all residents located east of Main Street in Anaconda (that had not requested sampling to date) to complete an Access Agreement to allow Atlantic Richfield to perform residential soils sampling.

1.1.2 Lead in Residential Soils

Two separate data sets containing screening-level lead concentrations in residential soils were generated and evaluated in 2007 (see Section 3.1). Following evaluation of these data sets, the Agencies determined that an amendment to the CS OU ROD (EPA, 1996) was required to include lead for soil RA. The amendment was due primarily to concentrations of lead in residential soils being higher than those originally reported in the remedial investigation/feasibility study (RI/FS). There was also a better understanding of the site conceptual model based on the large amount of RD/RA sample data collected since 1996 (see Section 1.4.7). The CS OU ROD Amendment (EPA/DEQ, 2013) changes only those provisions of the CS OU ROD (EPA, 1996) which deal with residential soils. Remedial decisions for commercial/industrial properties and active railroad beds remain unchanged.

1.2 Site Location and Description

The following is a description of the Anaconda Smelter National Priorities List (NPL) Site and the CS OU as provided in the CS OU ROD (EPA, 1996):

"The Anaconda Smelter National Priorities List (NPL) Site is located in the Deer Lodge Valley in southwestern Montana, in and around the city of Anaconda and about 25 miles northwest of the city of Butte. Milling and smelting activities conducted at the Old Works and Washoe Reduction Works smelters for nearly 100 years have resulted in the contamination of various environmental media in the surrounding area, primarily through airborne emissions and disposal practices from smelting operations.

The Anaconda Smelter NPL Site has been divided into several operable units (OUs), two of which have not been completed: the Community Soils OU and the Anaconda Regional Water, Waste, and Soils (ARWWS) OU. The study area for the Community Soils OU, as well as the ARWWS OU, covers approximately 300 geographic sections (1-square mile each) and includes the communities of Anaconda, Opportunity, Fairmont, Galen, and Warm Springs. The Community Soils OU, for which this Record of Decision (ROD) has been prepared, addresses all residential and commercial/industrial soils throughout the NPL Site. The Community Soils OU Remedial Investigation/Feasibility Study (RI/FS) characterizes residential and commercial/industrial soils and railroad beds, and provides a procedural means to identify and evaluate alternatives that remedy human health risks in residential and commercial/industrial areas within the site.

The Community Soils area of concern is generally bounded on the east and south by the border of Deer Lodge and Silver Bow Counties, on the west by the Anaconda West Valley, and on the north by the border of Deer Lodge and Powell Counties. The majority of this land is classified as rural. The Community Soils OU consists of the five communities within this area, and all other residential areas within the Anaconda Smelter NPL Site. The five communities included in the study area have a combined population of under 8,600 (Peccia & Associates 1992).

Prior to closure of smelter operations in 1980, the Anaconda Smelter was a source of substantial air emissions at the site. The distance and direction of each of the five communities from the stack located on Smelter Hill are: Anaconda, less than one mile northwest; Opportunity, 3.0 miles east; Fairmont, 6.8 miles southeast; Warm Springs, 7 miles northeast; and Galen, 10.4 miles northeast. Other sources of aerial contaminants related to the Anaconda milling and smelting operations have also contributed to community soils contamination."

The following is a description of the expanded area of concern (AOC) as provided in the CS OU ROD Amendment (EPA/DEQ, 2013):

"For this amendment, the EPA considers the area of concern for lead contaminated soils and interior dust to be the Anaconda-Deer Lodge County Superfund Planning District. The

Superfund Planning District boundary is shown in Appendix A. The EPA is eliminating the need to define a Focus Area, as all previously sampled residences under the arsenic residential soils remedial action will be addressed under this action. All residences with unremeditated yard components exceeding the 400 mg/kg cleanup level will be addressed, with prioritization given to yards where the existing data indicate the surficial soils are present that exceed the 400 mg/kg lead cleanup level. All other residences in Anaconda and within ADLC's Superfund Planning District boundary will continue to be sampled on an opportunistic basis (e.g. sampling by request)."

1.3 Site History – Pre-1996 ROD

The following is a description of smelting operations, enforcement activities, and the scope of the RA for the CS OU as summarized in the CS OU ROD (EPA, 1996):

"Around 1884, the Anaconda Mining Company (AMC) and its predecessors commenced large copper concentrating and smelting operations at the area presently known as the Old Works. The Old Works was located on the north side of Warm Springs Creek, west of Anaconda, and operated until about 1901. In about 1902, ore processing and smelting operations began at the Washoe Reduction Works (also called the Anaconda Smelter, the Washoe Smelter, the New Works, and the Anaconda Reduction Works) on Smelter Hill, south of Warm Springs Creek across from the Old Works which was owned and operated by AMC, its successors, and/or its subsidiaries. In 1977, Atlantic Richfield Company (ARCO) purchased AMC and expressly assumed its liabilities. Operations at the Anaconda Smelter ceased in 1980, and the smelter facilities were dismantled soon thereafter. The only substantial feature remaining from the smelter facility is the large brick smelter stack on Smelter Hill. ARCO has been identified as the Potentially Responsible Party (PRP) for this site.

The Anaconda Smelter NPL Site was placed on the NPL in September 1983, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The U.S. Environmental Protection agency (EPA) issued both general and special notice letters to ARCO on several occasions and ARCO has been actively involved in conducting investigations and response actions at the site since that time. On April 12, 1984, ARCO entered into an Administrative Order on Consent (AOC) with EPA to conduct demolition activities at the smelter. In October 1984, ARCO entered into another AOC to conduct several investigations at the Anaconda Smelter NPL Site to characterize soils, surface water, groundwater, and solid wastes. Early draft reports based on initial investigations indicated wide-spread contamination and the need for more in-depth study.

In the initial stages of the investigations, it was discovered that the soils within the community of Mill Creek, located two miles east of Anaconda, had elevated levels of arsenic. Children in Mill Creek also had elevated urinary arsenic levels, indicating an excess exposure to arsenic in their environment. Families with young children were temporarily relocated from the community in May 1986. At that time, flue dust, the most concentrated arsenic and heavy metal source on the site, was sprayed with surfactant to reduce fugitive emissions, and contaminated road dust in the community was treated to reduce inhalation exposures. Following temporary relocation, none of *these children had levels of urinary arsenic above the levels of concern as determined by the Center for Disease Control.*

In July 1986, EPA entered into an AOC with ARCO to conduct an expedited RI/FS for the Mill Creek community. The ROD for Mill Creek was completed in October 1987. The selected remedy was the permanent relocation of all Mill Creek residents. EPA negotiated a Consent Decree with ARCO concerning the implementation of the relocation remedy for Mill Creek residents on January 7, 1988. The permanent relocation was completed in fall 1988.

The generation and airborne transport of stack particulate and fugitive dust emissions during smelting operations also resulted in contamination of soils and household dust by arsenic, cadmium, copper, lead, and zinc in other areas surrounding the smelter. In addition, it was suspected that contaminated material from the Old Works Smelter facilities was present around homes in three Anaconda neighborhoods (Teresa Ann Terrace, Elkhorn Apartments, and Cedar Park Homes).

On September 28, 1988, ARCO entered into an AOC (Docket No. CERCLA VIII-88-06) with EPA to conduct an Engineering Evaluation/Cost Analysis (EE/CA) study and investigation for the Old Works and Community Soils OUs of the Anaconda Smelter NPL Site. Results of sampling conducted by ARCO in 1988–1989 in the areas of Teresa Ann Terrace, Elkhorn Apartments, and Cedar Park Homes indicated the presence of elevated heavy metal concentrations at or near the soil surface. Sampling conducted by ARCO in 1990 confirmed the presence of elevated concentrations of heavy metals in several yards, gardens, and common areas of the three neighborhoods.

On September 17, 1991, an Action Memorandum (with a concurrent AOC) required ARCO to conduct a Time-Critical Removal Action (TCRA) by excavating and removing contaminated soils in areas of Teresa Ann Terrace, Elkhorn Apartments, and Cedar Park Homes where arsenic concentrations exceeded 250 milligrams per kilogram (mg/kg). Under the TCRA, removal of arsenic-contaminated soils to 18 inches and replacement of topsoil and grass began in late 1991 and was completed in September 1992. Removal occurred on about 8 acres of undeveloped lots and 19 yards in Teresa Ann Terrace, on 32 yards around the Elkhorn apartments, and on 14 yards around Cedar Park Homes.

In 1991, ARCO and EPA amended an AOC (Docket No. CERCLA VIII-88-16) to conduct the Anaconda Soils Investigation to provide information to support future RI/FS activities at the Anaconda Smelter NPL Site. The investigation focused on five geographic areas: community soils; near community soils; community targeted soils; regional soils; and regional targeted soils. One of the primary objectives of the investigation was to delineate the nature and extent of metals contamination resulting from airborne particulate deposition.

In 1992, ARCO initiated an Arsenic Exposure Study through the University of Cincinnati, to measure arsenic in Anaconda residents and evaluate possible exposure pathways. Several hundred families participated in this study to provide environmental (i.e., soil, dust, food, and water) and biological (i.e., urine) data. Data from this study was utilized by EPA in the Final

Baseline Human Health Risk Assessment (HHRA) for the Anaconda Smelter NPL Site (CDM Federal 1996a).

Also in 1992, EPA and ARCO further amended AOC 88-16 to conduct the Old Works/East Anaconda Development Area (OW/EADA) OU investigations. The March 1994 ROD for the OW/EADA OU selected a combination of engineering and institutional controls (ICs) as the remedy. Remediation of recreational and commercial/industrial areas was conducted where waste and soils exceeded arsenic levels of 1,000 and 500 ppm, respectively.

In early 1994, EPA began the scoping process for the human health risk assessment, culminating in the completion of the Final Baseline HHRA in January 1996.

In 1995, ARCO and EPA entered into the 8th Amendment to AOC 88-16 to conduct a Phase I Soils Remedial Investigation from previous studies to support both the Community Soils and ARWWS OUs. This investigation contains the completed characterization of residential soils at the site. The Feasibility Study (FS) portion of this Community Soils RI/FS was conducted under the 7th Amendment to the AOC in 88-16.

The Community Soils OU addresses all remaining residential and commercial/industrial soils of the Anaconda Smelter NPL Site. This OU will also bring closure to previous actions conducted at residential properties within the site (i.e., Community Soils TCRA and actions taken through the County's Development Permit System) as well as commercial/industrial properties. Other cleanup actions, not related to soil contamination, have been selected and implemented at the Anaconda Smelter NPL Site."

1.4 Site History – Post-1996 ROD

The following sections summarize activities within the CS OU that addressed residential and commercial/industrial soils following issuance of the CS OU ROD (EPA, 1996). The following sections are excerpts from the CS OU ROD Amendment (EPA/DEQ, 2013):

1.4.1 Implementation of the 1996 ROD

"The 1996 Community Soils OU ROD addressed all remaining residential and commercial/industrial soils of the Site, and brought closure to previous actions conducted at residential properties therein (i.e., Community Soils time-critical removal action, and actions taken to date through Anaconda – Deer Lodge County's (ADLC's) Development Permit System [DPS], as well as commercial/industrial properties).

Major components of the remedy for residential soils as specified in the 1996 ROD are:

- *Clean up current residential soils exceeding the residential action level of 250 ppm arsenic, through removal, replacement with clean soil, and placement of a vegetative or other protective barrier.*

- *In areas where site conditions dictate that soil removal is not implementable, treatment or other measures (e.g., capping, tilling, institutional controls [ICs]) will be taken to reduce arsenic concentrations to below 250 ppm or to prevent exposure.*
- *Clean up all future residential soils, at the time of development, that exceed the residential action level of 250 ppm soil arsenic concentration through the DPS.*
- *Implement ICs to provide educational information to all residents describing potential risks, and recommendations to reduce exposure to residual contaminants in soils, and to ensure the long-term viability of the remedy.*

Major components of the remedy for commercial/industrial soils are:

- *Clean up current commercial or industrial areas that exceed the commercial/industrial action level of 500 ppm soil arsenic concentration through a combination of revegetation techniques and/or engineered covers.*
- *Clean up all future commercial or industrial areas at the time of development that exceed the action level of 500 ppm soil arsenic concentration through the ADLC DPS.*

Major components of the remedy for the Anaconda railroad beds are:

- *Construct an engineered cover over all contaminated railbed material within the community of Anaconda to prevent direct contact with, and reduce potential for erosion and transport of, contaminated materials to residential and commercial/industrial areas.*
- *Separate the railbed from residential and commercial/industrial areas with a barrier to restrict access to the railbed and to control surface runoff from the railbed through the use of retaining walls and/or curbing.*
- *Maintain existing ICs to restrict access."*

1.4.2 2002 to 2005 – Remedial Design/Remedial Action

"Using data collected during the remedial design investigation (Atlantic Richfield 1997), the Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR) was finalized in 2002 (Atlantic Richfield 2002). The RAWP/FDR was approved in 2002, and the focus area for Anaconda was expanded to include all yards east of Main Street. The cleanup strategy used a two-phase sampling approach. This approach was based on findings in the site characterization that fallout from smelter emissions was the primary source of contamination and that contaminant levels would be higher at the surface and decrease at depth. Soil and/or aggregate covers were used over portions of the residential yards where concentrations exceeded 250 ppm to minimize the potential risk of human exposure. The treatment type selected for each residential yard was based on the supplemental remedial action data collection activities. Individual site work plans were developed for specific areas requiring remedial action. The

extent of soil removal and soil cover or aggregate cover placement for residential yards was determined through the supplemental data collection activities.

In 2002, Atlantic Richfield began sampling residential yards in Anaconda and the rural area under an approved remedial design. Of 1,740 sampled yards, 350 had calculated average arsenic concentrations that exceeded the cleanup action level of 250 ppm. Those yards were cleaned up. This number of yard cleanups was significantly more than the 10 to 50 yards estimated in the 1996 ROD, and the results of the remedial design sampling, especially in subsurface soil, conflicted with the RI site characterization.

After the 1996 ROD was issued, the EPA became aware of several historic abandoned railroad beds within the community of Anaconda. These railroads often were constructed out of mining and smelting waste materials, and contained high concentrations of arsenic. Consistent with the 1998 Anaconda Regional Water, Waste and Soils OU ROD, known historic railroad beds have been removed, waste materials have been transported to designated waste management areas for disposal, and the remediated areas have been reclaimed commensurate with existing land use under the Final Historic Railroads and Commercial/Industrial Areas Remedial Action Work Plan/Final Design Report (Atlantic Richfield 2005).”

1.4.3 2006 – Five Year Review

“The 3rd 5-year review for the Site (EPA 2006) cited issues related to finding arsenic concentrations that were significantly higher than anticipated based on previous remedial investigation/feasibility study (RI/FS) data. At the request of the EPA and DEQ, Atlantic Richfield analyzed archived soil samples from Anaconda residential yards where weighted average concentrations were below 250 ppm arsenic. 142 Anaconda yards were selected (approximately 10 percent of the yards evaluated in remedial action Phase 1) from which lead concentrations were determined in surface soils.

Atlantic Richfield also conducted additional sampling and analysis of interior (living space), exterior, and attic dusts in 52 Anaconda and regional residences. Houses were located in Anaconda (east and west of Main Street), Opportunity, and rural areas. Samples were also collected from newer houses (e.g., those built after 1975).

Additionally, the Agency for Toxic Substances and Disease Registry (ATSDR) received a request from a local resident to evaluate the arsenic residential soil cleanup level from the 1996 ROD.”

1.4.4 2007 – Data Collection

“Atlantic Richfield provided the lead data set from the 2006 activities and a memorandum Analysis of Lead in Anaconda Community Soils (Atlantic Richfield 2007) to the EPA in 2007. In September and October, the EPA conducted a subsurface soil characterization study in Anaconda. Crews collected 221 subsurface soil samples from 107 residential yards under an EPA-approved sampling and analysis plan (CDM 2007) with the following objectives:

- *Arsenic. Identify residential properties that were previously tested and were not scheduled for further sampling or remediation to evaluate subsurface soil arsenic concentrations.*
- *Lead. Quantify lead concentrations in subsurface soils and evaluate any relationship between arsenic and lead concentrations.*

EPA focused on building a new data set of subsurface soil analytical results from residential yards where no remediation occurred (e.g., those where the area weighted average arsenic concentrations for surface soils were less than 250 ppm) and remediated properties with individual yard components (front yards, back yards, earthen driveways, gardens, play areas, etc.) with surface soil results less than 250 ppm. The results of this sampling were reported in Community Soils OU Residential Subsurface Soil Characterization Data Summary Report (CDM 2007).

ATSDR completed their health evaluation from 2006 based on a review of available literature and made the following conclusions in their draft report Evaluation of Residential Soil Arsenic Action Level (ATSDR 2007):

- *Exposure and bioavailability assumptions in EPA's 1996 baseline human health risk assessment (HHRA) for Anaconda are reasonable in estimating risk. However, ATSDR recognizes the potential for uncertainty in the bioavailability factors chosen for soil and dust in Anaconda.*
- *Chronic exposure to soil at the residential cleanup level of 250 ppm arsenic would not be expected to result in adverse health effects for resident children or adults, regardless of anticipated uncertainties of bioavailability or other exposure assumptions from the HHRA.*
- *Children who exhibit soil pica behavior could experience adverse health effects if they ingest gram quantities of soil containing arsenic, and areas with soil arsenic concentrations high enough to cause adverse health effects could remain after cleanup.*
- *Changing conditions at the soil surface due to activities such as excavation could increase the risk and may require further evaluation.*

ATSDR also made the following recommendations to prevent potentially harmful exposures:

- *EPA and Atlantic Richfield should continue cleanup of residential properties.*
- *The Community Protective Measures Program (CPMP) should include education of parents about risks associated with soil pica behavior in children.*
- *The CPMP should include measures to protect against potential recontamination of residential surface soils with arsenic-contaminated subsurface soils.*

ADLC has developed an interim CPMP under their interim institutional controls plan. A final CPMP is currently being developed cooperatively by ADLC, Atlantic Richfield, EPA and DEQ."

1.4.5 2008 - Data Interpretation and Analysis Report

"Atlantic Richfield provided the Agencies with the results of their 2007 dust study in the Draft Final Community Soils Interior and Attic Dust Characterization Study Data Summary Report (Atlantic Richfield 2008). The Agencies evaluated theses data, the soil lead data set provided by Atlantic Richfield, and the results from the additional sampling in 2007 and drew the following conclusions in Residential Soils Data Interpretation and Analysis Report (DIAR) (CDM 2008):

- *Lead in soils. 95 of the 142 yards (67 percent) that were sampled but not cleaned up had area weighted average lead concentrations above 400 ppm. 125 of the 142 yards (88 percent) evaluated had surface soil lead concentrations above 400 ppm in at least one yard component. 33 of the 142 yards (23 percent) had surface soil lead concentrations in at least one yard component greater than 1,200 ppm. The actual average concentration of lead in surface soils was 507 ppm, which is much higher than the calculated 290 ppm average from the 1996 HHRA.*

- *Arsenic in subsurface soils. Some portions of about one third of yards sampled but not cleaned up exceed 250 ppm arsenic in the subsurface. Soils with elevated arsenic generally also have elevated lead and vice versa. Correlations are weaker in subsurface soils than surface soils.*

- *Attic dust. Attic dust concentrations in the Anaconda focus area are significantly higher than interior dust concentrations and show no correlation, suggesting that attic dust does not influence interior dust.*

- *Rural areas. In most rural areas, smelter emissions appear to be the only site-related source of contamination. The exception is part of South Opportunity/Crackerville where tailings were deposited by Silver Bow Creek flooding events and irrigation practices."*

1.4.6 2010 – Five Year Review

"The 4th 5-year review for the Site was completed in September 2010 (EPA 2010). For the Community Soils OU, the 5-year review noted that Atlantic Richfield had cleaned up over 300 yards in Anaconda and 47 in the nearby communities. The remedial action completed to date has addressed the surficial (0 to 2 inch) arsenic in residential soils. Interim controls include ADLC's CPMP to communicate to residents risk/protectiveness information related to remaining contaminants. However, there is still concern that the remaining contaminants (especially lead) may pose an unacceptable risk. Therefore, a protectiveness statement was deferred. Additionally, the 5-year review noted that for the remedy to be protective in the long-term, final ICs must be completed."

1.4.7 Basis for Amendment

"The original Community Soils OU RI/FS primarily addressed human health risks from contact with contaminated soils and resulted in the development of a residential soil action level for

arsenic. Areas of concern included yards and other areas frequented by children. Potential source areas within the communities, including railroad beds and imported waste/fill areas, were also to be addressed. Based on the findings of the original RI/FS, the 1996 ROD specified cleanup of contaminated residential soils having arsenic concentrations above an action level of 250 ppm in the upper 18 inches of the soil profile."

"In 2002, EPA and DEQ approved the Residential Soils Remedial Action Work Plan/Final Design Report for the Community Soils OU (Atlantic Richfield 2002). Since then, approximately 1,740 residences in Anaconda and the surrounding rural area have been sampled and 350 yards where the average arsenic concentration for the yard exceeded the 250 ppm residential use action level in the surface soil (0 to 2 inches) have been cleaned up. Data collected during cleanup show that some of the assumptions used to develop the site characterization need to be updated. Although smelter emission fallout remains the primary source of arsenic and lead contamination, it is now clear that at some properties within the Site, other sources of contamination are also present.

After examination of the data, EPA conducted additional studies to determine the significance of the findings. Three main concerns were identified from these studies:

- *Elevated arsenic and lead concentrations are present in deeper soils.*
- *Elevated lead is present in yards that were not cleaned up.*
- *Elevated arsenic and lead are present in indoor dust.*

Based on these concerns, EPA has identified the need for fundamental additions to the original remedy to ensure protection of human health. The amended remedy differs from the 1996 ROD in the addition of a cleanup level for lead in soils and cleanup levels for arsenic and lead in accessible interior dust, and expansion of the ICs as implemented through the CPMP to include a lead health education program. All other components of the original remedy remain unchanged. Note that concerns with remaining elevated arsenic concentrations at depth will be addressed during remedial design.

Changes are due primarily to the finding of higher lead concentrations in residential soils than anticipated compared to the RI/FS data, and a better understanding of the site conceptual model based on the large amount of remedial action and other sample data collected since 1996. The original model of contaminant deposition at the Site was evenly dispersed smelter emissions in shallow soils (Exhibit 6). However, data collected since 1996 have caused the model to be changed to include:

- *Covered over historic emissions. Most yards in East Anaconda were not constructed or landscaped until the 1940s and 50s (after nearly 60 years of smelter operations). This is believed to have resulted in cleaner surface soils being placed over contaminated soils in some locations.*

- *Imported mining-related waste. Property owners reported that previous residents may have brought in mining and smelting wastes as fill material for yards in low spots or for driveways. This material was also used as fill for streets and trolley lines.*

- *Lead paint contamination in soils. Many houses were painted with lead-based paint that can or has deteriorated and contaminated surrounding soils. Sometimes this paint has been scraped and the house repainted at least once…"*

1.5 Description of the CS OU Selected Response Action

This section summarizes the selected response action presented in the CS OU ROD (EPA, 1996) and the CS OU ROD Amendment (EPA/DEQ, 2013), as modified by discussions between the EPA and Atlantic Richfield, and approved by the EPA in a letter dated September 8, 2014.

The EPA's selected remedy for the ADLC SPAOD will protect human health through the following:

- Reduction of arsenic and lead concentrations in residential soils and attic dust to acceptable levels; and/or

- Prevention of direct human contact with mining and smelting-related waste materials exceeding acceptable levels.

Major components of the CS OU remedy (for residential soils and attic dust) include:

1. Perform RA for all current residential soils ≥ 250 parts per million (ppm) arsenic (based on the AWA calculation) and/or ≥ 400 ppm lead concentration to a maximum depth of 12 inches, by removing and replacing with clean soil and placing vegetative or landowner preferred landscaping (i.e., wood chips, gravel, etc.). Yard components remediated to 12 inches or more below ground surface (bgs) during the previous CS OU RA will not require further sampling or remediation.

   During residential soil sampling, field crews will note residential properties with obvious or suspected lead paint. These properties will be referred to ADLC for follow up. In an attempt to minimize the potential of recontamination of residential soils, the landowner will be given up to 12 months to abate the suspected lead paint in advance of RA. If the landowner chooses not to remove exterior lead paint in advance of RA, Atlantic Richfield will proceed with RA, but will not be responsible for addressing any recontamination of residential soils caused by exterior lead paint.

2. Remediating attic dust ≥250 ppm arsenic and/or ≥ 400 ppm lead through removal/encapsulation. Attic dust will be sampled only when an exposure pathway to an attic exists and the home was constructed prior to 1980 (year that the Anaconda Smelter was shut down). Interior dust will not be sampled under this design. The basis for excluding interior dust is detailed in Appendix E, Attachment B-2: *Technical Memorandum #1 – Basis for Excluding Living Space Dust and Addressing Only Accessible Attic Dust through*

Analysis of the Existing Data (Atlantic Richfield Company, 2014a). The Agencies approved this change in the September 8, 2014 letter provided in Appendix E, Attachment B-3.

3. Access agreements for soil and attic dust sampling will be pursued for those residences with screening level lead data in soil $\geq$ 400 ppm. Atlantic Richfield will conduct a maximum of 3 mailings to attempt to contact eligible landowners to obtain access agreements for sampling. If a resident does not respond after 3 mailings, Atlantic Richfield will conduct a combination of telephone calls and/or visits to the home, as appropriate, to encourage access. Residences with screening level lead data below the 400 ppm action level, residences that have been sampled previously but have no lead data available, and residences within the ADLC SPAOD that have not been sampled previously may request sampling of their soil and attic dust.

4. Those alleys which have previously not been subject to RA for arsenic, and with screening level lead data in soil $\geq$ 400 ppm lead, will be resampled for lead to determine the need for RA. Alley samples will not be analyzed for arsenic because RA decisions based on arsenic concentrations have already been made.

5. In areas where specific site conditions dictate that removal cannot be performed, treatment or other measures (e.g., capping, tilling, Institutional Controls [ICs]) will be taken to reduce metal concentrations below the respective action levels (250 ppm for arsenic and 400 ppm for lead) to prevent exposure.

6. Remediate all future residential soils and attic dust (per attic dust eligibility criteria presented in Section 1.6) that exceed the residential action levels for arsenic and lead, at the time of development, through the ADLC Development Permit System (DPS) and/or CPMP.

1.6 Community Soils OU Remedial Action Objectives

The primary objective of the CS OU RA addressed in this RAWP/FDR is to remediate residential yard components to below the residential action levels of 250 ppm arsenic and 400 ppm lead to a maximum depth of 12 inches (with the exception of vegetable/flower gardens, which will be remediated to a maximum depth of 24 inches) by removing and replacing soil, placing permanent covers, and/or ICs in a manner consistent with the CS OU ROD (EPA, 1996) and the CS OU ROD Amendment (EPA/DEQ, 2013). Residential yard components that were previously remediated to a depth of 12 inches or greater are not subject to sampling or RA under this RAWP/FDR.

Residential soils frequented by children including yards, parks, school grounds (including daycares and preschools), or other play areas are also subject to CS OU sampling/remediation. Similarly, common areas adjacent to yards which may contribute to the contamination of yards and which may be frequented by children such as barren driveways and unpaved alleys will also be evaluated.

In addition to addressing residential soils, attic dust will also be addressed under this design with the objective to remove and encapsulate accessible attic dust with concentrations $\geq$ 250 ppm arsenic and/or ≥ 400 ppm lead, when certain conditions are met. Attic dust will only be sampled if the home was constructed prior to 1980 and at least one of the following conditions is met (subject to confirmation by Atlantic Richfield, as appropriate):

1. The attic is used as living space;

2. On average, the resident(s) enters the attic more than once per week;

3. Ceilings in the living space immediately below the attic are in a condition of disrepair with obvious exposure to the attic; or

4. The resident has contacted ADLC (per CPMP public outreach programs) regarding concerns about potential exposure to attic dust, which may result from a home remodeling project. .

If the above qualifications are met, attic dust samples will be collected. If the criteria are not met, then no exposure pathway to the attic exists and the attic does not pose an unacceptable risk to the residents.

All residential soils and attic dust information generated under this design (i.e., sample results, survey data, Individual Site Work Plans [ISWPs], As-Builts, etc.) will be recorded in the CS OU database and Geographic Information System (GIS) for use by regulators, prospective home buyers, lenders, contractors, and other interested parties.

All CS OU RA work will be performed in accordance with the CS OU Performance Standards located in Appendix G.

2.0 ACTION LEVELS

The CS OU ROD (EPA, 1996) established an arsenic action level for residential soils. The CS OU ROD Amendment (EPA/DEQ, 2013) added a lead action level for residential soils as well as both arsenic and lead action levels for residential attic dust. The CS OU residential soils and attic dust action levels are as follows:

- Residential Soils (Arsenic) –AWA ≥ 250 ppm.

- Residential Soils Gardens (Arsenic) – ≥ 250 ppm (component-specific, not subject to AWA).

- Residential Soils (Lead) –≥ 400 ppm.

- Residential Soils Gardens (Lead) – ≥ 400 ppm

- Attic Dust (Arsenic) –≥ 250 ppm.

- Attic Dust (Lead) –≥ 400 ppm.

3.0 BASIS OF DESIGN

The remedial design (RD) for residential soils and attic dust presented in this RAWP/FDR is based on a combination of the *Final Community Soils Operable Unit (CS OU) Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* (Atlantic Richfield Company, 2002a) RD, the CS OU ROD Amendment (EPA/DEQ, 2013), and the guidelines within the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003a).

3.1 Residential Soils

There are three CS OU soil lead data sets that exist. The first lead data set consists of screening quality data collected under the original CS OU RD sampling activities. This x-ray fluorescence (XRF) data set was not used under the original design and therefore was not subject to any quality assurance/quality control (QA/QC) review. Additionally, archived CS OU alley samples (that were originally only analyzed for arsenic) were analyzed for lead in July 2015. Due to the extended holding times these samples experienced, these 2015 lead data results will be considered screening level quality data. The second data set was collected by EPA in 2007, which includes random spatial locations and depth intervals. Due to the nature of these first two data sets, they will be used to prioritize residential yards for sampling, but will not be used for determining RA. The third data set was collected by Atlantic Richfield in the Opportunity and Crackerville areas in 2012. This third data set is enforcement level quality and therefore is not subject to re-sampling. Residential soils and attic dust, as well as alleys, will be targeted for sampling if existing lead concentrations are $\geq$ 400 ppm. All other residences within the ADLC SPAOD (including those residences previously remediated for arsenic) may request soil and attic dust sampling.

Atlantic Richfield will submit an access agreement to each residence where existing lead concentrations in soils are $\geq$ 400 ppm. A questionnaire (located in Appendix H) will be attached to the access agreement requesting information from the landowner regarding the presence of sensitive populations within the home (i.e., pregnant women and/or children 12 years of age or younger) as well as age of the home and activities/circumstances that may result in exposure to attic dust. This information will be used to aid in prioritizing residential yards and attics for sampling. The highest priority for sampling will be given to residences with the highest lead concentrations in conjunction with presence of sensitive populations.

When performing RA under the 2002 CS OU design, residential soil removal/replacement was extended to a maximum depth of 18 inches. The CS OU ROD (EPA, 1996) states, "*In areas where soil removal is to be implemented, only the depth of soil that is greater than 250 ppm soil arsenic concentration, to a maximum of 18 inches, will be removed. The maximum 18-inch depth is based upon possible activities that might be conducted in a yard (i.e., garden, play area, or other excavation).*" Under this updated design, soil removal/replacement will extend to a maximum depth of 12 inches. The 12-inch maximum removal depth is appropriate, as it attains the human health risk reduction objectives for metals as specified in the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003a). The 12-inch maximum depth is detailed further in Appendix E, Attachment B-1: Technical Memorandum #2 – *Modifying the Sample Depth Intervals Used to Make Remedial Decisions for Arsenic and Lead in Yard Soils*

(Atlantic Richfield Company, 2014b). The Agencies approved this change in the September 8, 2014 letter provided in Appendix E, Attachment B-3.

Residential soil sampling conducted in vegetable/flower gardens will be evaluated at the 0 to 2-inch, 2 to 6-inch, and 6 to 12-inch, 12 to 18-inch and 18 to 24-inch depth intervals. This is consistent with the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003a) which states, *"Twenty-four (24) inches of clean soil cover is generally considered to be adequate for gardening areas; however site specific conditions that may require more soils cover (e.g., presence of burrowing animals) should be considered. A 24-inch barrier normally is necessary to prevent contact of contaminated soils at depth with plant roots, root vegetables, and clean soil that is mixed via deep rototilling."*

Consistent with the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003a), RA decisions applicable to removing soils with lead concentrations $\geq$400 ppm, will be based on a component-specific basis. Samples will be collected at the 0 to 2-inch, 2 to 6-inch, and 6 to 12-inch depth intervals. The rationale behind the specified sampling depth intervals is detailed further in Appendix E, Attachment B-1: *Technical Memorandum #2 – Modifying the Sample Depth Intervals Used to Make Remedial Decisions for Arsenic and Lead in Yard Soils* (Atlantic Richfield Company, 2014b). Vegetable and flower gardens are the only yard components that will be sampled deeper than 12 inches. Additionally, RA decisions for vegetable and flower gardens for arsenic will not be based on an AWA calculation. Similar to lead, RA decisions for vegetable and flower gardens for arsenic will be determined on a component-specific basis.

Consistent with the original CS OU design, RA decisions applicable to removing soils with arsenic concentrations $\geq$ 250 ppm, will be based on an AWA basis. For residences that were previously sampled under the original CS OU design, AWA arsenic concentrations were already calculated for the 0 to 2-inch depth interval; consequently, samples collected from the 0 to 2-inch depth interval under this design will be analyzed for lead only (not to include arsenic). An AWA arsenic concentration will not be recalculated for this depth interval. However, AWA arsenic concentrations will be calculated for 2 depth intervals (2 to 6 inches and 6 to 12 inches). Any clean cover soil in previously remediated components will not be resampled under this design, but will be assigned an average arsenic concentration of 19.1 ppm, which is the average arsenic concentration measured in the 100 Type A borrow soil samples collected during the previous CS OU RA (see Table 1). This approach is consistent with the Data Quality Objectives and acknowledges the clean soil in components previously remediated.

For residences that were not previously sampled under the original CS OU design, AWA arsenic concentrations will be calculated at 3 depth intervals (0 to 2 inches, 2 to 6 inches, and 6 to 12 inches). Vegetable and flower gardens are the only yard components that will be sampled deeper than 12-inches. Additionally, RA decisions for vegetable and flower gardens for arsenic will not be based on an AWA calculation. Similar to lead, RA decisions for vegetable and flower gardens for arsenic will be determined on a component-specific basis.

Residential properties with suspected exterior lead paint will be identified by soil sampling field crews and referred to ADLC for follow up. In an attempt to minimize the potential for recontamination of residential soils, the landowner will be given up to 12 months to abate the suspected lead paint in advance of RA activities. If the landowner chooses not to remove exterior lead paint in advance of RA activities, Atlantic Richfield will proceed with RA (as necessary), but will not be responsible for addressing any recontamination of residential soils caused by exterior lead paint.

During residential soils sampling, field crews will note any areas on adjacent properties that are readily available and frequented by children. If any such areas are noted, access agreements for sampling will be pursued from the appropriate landowner.

Sampling and RA applicable to alleys will be limited to a depth of 6 inches. Alleys are well compacted with infrequent exposure by residents and are unlikely to be excavated by hand tools by residents to a depth beyond 6 inches. Additionally, a General Utility and Services (GUS) permit is required for mass excavation in alleys by ADLC personnel and contractors; consequently, potential exposure to deeper soils in alleys will be addressed through ICs.

Consistent with the original CS OU design, all contaminated soils removed from residential yards and alleys will be disposed of within an appropriate disposal facility approved by EPA. Excavated areas within residential yards will be backfilled with clean soil and covered with sod, seeded with native vegetation species, or covered with other landowner preferred landscaping materials (i.e., wood chips, gravel, etc.). The yard area will be defined as a maximum of 125 feet from the exterior of the residence, unless a property boundary or natural barrier (i.e., fence, hedge, tree line, abrupt change in grade, etc.) is encountered at a distance less than 125 feet. The 125-foot distance is considered a guideline and can be adjusted in the field by Agency personnel as appropriate.

Any visible mining and smelting-related waste that may be encountered while performing RA in residential areas will be addressed as miscellaneous waste. For consistency, the Agencies have determined that visual mining and smelting-related waste materials located throughout the site will be addressed as miscellaneous wastes in accordance with the selected remedy identified in the ARWW&S OU ROD (EPA, 1998). The ARWW&S OU remedy generally requires that miscellaneous waste materials located outside of a designated WMA must be removed and consolidated within an appropriate disposal facility approved by EPA.

Similar to contaminated soils, visible mining and smelting-related waste removal/replacement will extend laterally until encountering an existing barrier (e.g., concrete sidewalk or foundation, tree roots, asphalt pavement, etc.) and to the depth where the mining and smelting-related waste is no longer visible.

3.2 Attic Dust

This design addresses sampling and remediation of accessible attic dust. Interior dust (living space dust) is not addressed as part of this design. The basis for excluding interior dust sampling and the criteria for addressing attic dust are covered in Appendix E, Attachment B-2: *Technical Memorandum #1 – Basis for Excluding Living Space Dust and Addressing Only Accessible Attic Dust through Analysis of the Existing Data* (Atlantic Richfield Company, 2014a). The Agencies approved this change in the September 8, 2014 letter provided in Appendix E, Attachment B-3.

Atlantic Richfield will submit an access agreement for attic dust sampling to each residence where existing lead concentrations in soils are ≥ 400 ppm lead. All other residences within the ADLC SPAOD (including those residences previously remediated for arsenic) may request attic dust sampling. A questionnaire (located in Appendix H) will be attached to the access agreement requesting information from the landowner regarding the presence of sensitive populations within the home (i.e., pregnant women and/or children 12 years of age or younger) as well as age of the home and activities/circumstances that may result in exposure to attic dust. This information will be used to aid in prioritizing residential yards (and attics) for sampling. The highest priority for sampling will be given to residences with the highest lead concentrations in residential soils in conjunction with presence of sensitive populations.

In order to be eligible for attic dust sampling, the home must have been constructed prior to 1980 and meet at least one of the following requirements (subject to verification by Atlantic Richfield, as appropriate):

1. The attic is used as a living space.

2. On average, the resident(s) accesses the attic more than once per week. Criteria based upon *Assessing Intermittent or Variable Exposures at Lead Sites* (EPA, 2003b);

3. There is an obvious exposure pathway (i.e., ceilings in the living space immediately below the attic are in a condition of disrepair) to the attic.

4. The resident has contacted ADLC (per CPMP public outreach programs) regarding concerns about potential exposure to attic dust, which may result from a home remodeling project.

If the above qualifications are met, attic dust samples will be collected. If the criteria are not met, then no exposure pathway to the attic exists and the attic does not pose an unacceptable risk to the residents.

Remedial action of accessible attic dust will consist of negative pressure dust removal/disposal followed by an application of a continuous layer of flame-retardant, penetrating encapsulant over all attic surfaces after dust removal is complete. If electrical components that do not comply with applicable residential electrical codes are discovered in the attic prior to dust removal (e.g., deteriorated knob and tube wiring), attic dust RA will not be conducted until the landowner agrees, in writing, to replace the out of date components. In the event that the landowner does not agree, in writing, to replace the out of date components, attic dust RA will not be conducted.

All lead and/ or arsenic contaminated materials (dust, filters, bags, insulation, debris, tags, etc.) generated during attic dust sampling and RA will be disposed of within an appropriate disposal facility approved by EPA.

4.0 PROJECT MANAGEMENT AND COMMUNICATION

The organizational chart and chain of communication for CS OU RA is shown on Figure 2. The purpose of this section is to provide guidance to efficiently manage the RA, including defining lines of authority, communication, project coordination, project meetings, and submittal requirements. The roles and responsibilities of the organizations involved in the RA are described in the following subsection.

4.1 Lines of Authority, Communication and Coordination

The organizations that will be involved in the CS OU RD and RA include the following:

- EPA Region VIII;
- DEQ;
- Atlantic Richfield;
- ADLC;
- Private Landowners;
- Construction Manager (Atlantic Richfield);
- QA/QC Atlantic Richfield Oversight Representative; and
- Construction Contractor(s).

The Agencies will have the authority for final approval of the RD and RA based on field observations and ongoing, regular reporting by Atlantic Richfield. The Agencies are responsible for reviewing project schedules and submittals provided to them by Atlantic Richfield. The Agencies will address all communications to the Atlantic Richfield Project Manager or to the designated Atlantic Richfield project representative.

Atlantic Richfield, or their designated project representative, will be responsible for providing construction management and verifying that the RA complies with the performance standards set forth in the CS OU ROD (EPA, 1996), CS OU ROD Amendment (EPA/DEQ, 2013), and the appropriate Unilateral Administrative Order (UAO). Atlantic Richfield will manage the project to focus on attaining the objectives listed in Sections 1.4 and 1.5. Atlantic Richfield and the EPA will coordinate to provide all project-related communications to federal, state, and local agencies, the public, and all other parties involved or interested. All activities will be coordinated by Atlantic Richfield to adhere to the milestone dates listed in the RD and RA schedule.

The ADLC's role will be defined in the Institutional Controls Implementation and Assurance Plan (ICIAP) and CPMP but is expected to include implementing public outreach educational programs, referring test requests to Atlantic Richfield, operating the DPS, and coordinating with landowners on the opportunity for confirming/abating lead paint.

The QA/QC construction oversight representative will report directly to Atlantic Richfield and will provide Atlantic Richfield with technical assistance on the project by performing QA/QC oversight of the construction contractor's work. The QA/QC construction oversight representative will observe, inspect and evaluate the contractor's compliance with this plan and all applicable performance standards. Any deviations from this Work Plan will require approval by the Agencies through the Request for Change (RFC) process.

The construction contractor will be responsible for performing designated activities associated with the RA in accordance with this plan and all applicable documents. The contractor will be responsible for communicating directly with the Atlantic Richfield project representative and/or the QA/QC oversight representative on all issues and concerns. The contractor will be responsible for scheduling the project activities with its subcontractors to complete certain work tasks by the associated milestone dates. The contractor will designate a primary contact person as the contractor's site representative.

The design engineer will report directly to Atlantic Richfield and will provide technical assistance throughout the duration of the project. The design engineer will verify the construction contractor's compliance with the Technical Specifications (Appendix C) and Standard Drawings (Appendix D).

4.2 Project Meetings

A pre-construction conference including representatives from Atlantic Richfield, EPA, DEQ, ADLC, QA/QC oversight representative, design engineer (as necessary), and the contractor will be scheduled before starting any construction activities. The purpose of the pre-construction meeting is to assure that all parties understand their respective responsibilities and the procedures that will be used to assure efficient completion of the work. The meeting will address scheduling (including critical milestone dates), submittal procedures, record keeping, use of premises, site security, health and safety procedures, material and equipment delivery and storage procedures.

Progress meetings (during both RD sampling and RA construction) including representatives from Atlantic Richfield, EPA, DEQ, ADLC, QA/QC oversight representative, design engineer (as necessary), and the contractor's site representative will be held weekly at a mutually agreed upon location. The progress meeting agendas will include, at a minimum, the status of work items initiated to date, scheduled work items for the following week, problems encountered and proposed solutions, and any health and safety or historic issues that have arisen in the past week or issues that are pertinent to the work scheduled for the following week.

5.0 FINAL DESIGN

Final RD details for both residential soils and attic dust are presented in Sections 5.1 and 5.2, respectively. Future changes to the design, if required, would be addressed by a Request for Change (RFC) process.

5.1 Residential Soils and Alleys Final Design

The CS OU residential soils final RD breaks down into the following major topics:

1. Project QAPP – The Residential Soils/Dust QAPP (located in Appendix E) details the means and methods for residential soils sampling activities. Specifically, each residential yard component (e.g., front yard, back yard, garden, etc.) will be sampled at three distinct depth

intervals to a maximum depth of 12 inches (with the exception of flower and vegetable gardens which will be sampled to a maximum depth of 24 inches and alleys which will be sampled to a maximum depth of 6 inches).

2. RD Soil Sampling – Access agreements for soil and attic dust sampling will be pursued by Atlantic Richfield for those properties with existing screening level lead concentrations $\geq$ 400 ppm in soil (see Appendix A and Appendix F). Atlantic Richfield will conduct a maximum of 3 mailings to attempt to contact eligible landowners to obtain access agreements for sampling. All other residences within the ADLC SPAOD (including those residences previously remediated for arsenic) may request soil and attic dust sampling. Residential yard components that were previously remediated to a depth of 12 inches or greater will not be subject to further sampling under this investigation.

3. ISWPs – Following soil sampling, analysis and data evaluation (for both arsenic and lead), ISWPs will be created for those properties with individual yard components $\geq$ 400 ppm lead and/or AWA $\geq$ 250 ppm arsenic. The ISWP will specify each component within a residential yard subject to RA and to what depth. Maximum removal/replacement depth for each component will be 12 inches (with the exception of flower and vegetable gardens which could extend to a maximum depth of 24 inches). The CS OU Residential Yard Remedial Action Decision Flow Charts (which are used to develop sampling rationale for individual components) are located on Figures 3 through 7.

4. Following alley sampling, analysis and data evaluation (for lead only), ISWPs will be created for those alleys with $\geq$ 400 ppm lead. The ISWP will detail the RD applicable to the alley. The maximum depth of soil removal/replacement in alleys will be 6 inches.

5. RA – Once ISWPs are developed and approved by the Agencies, Atlantic Richfield will pursue construction access agreements and proceed with RA. Soil removal/replacement will be conducted within each residential yard component to the depth specified in the ISWP. Removal/replacement will include any visible mining and smelting-related waste material that may be encountered. All excavations will be backfilled with clean cover soil, meeting applicable suitability criteria (Section 5.7.1.4), as detailed on the Standard Drawings (Appendix D) and revegetated (as appropriate based upon feedback from the landowners). All materials generated during RA activities will be hauled and disposed of within an appropriate disposal facility approved by EPA.

6. Project Data – All project data (including sampling results, survey data, ISWPs, As-Builts, etc.) will be uploaded into the CS OU database and GIS for future tracking and use.

5.2 Attic Dust Final Design

The CS OU attic dust final RD breaks down into the following major topics:

1. Project QAPP – The Residential Soils/Dust QAPP (located in Appendix E) details the means and methods for CS OU attic dust sampling activities. For each residence that qualifies for

attic dust sampling, a minimum of two dust subsamples will be collected and composited for analysis.

2. RD Attic Dust Sampling – Access agreements for soil and attic dust sampling will be pursued by Atlantic Richfield for those properties with existing screening level lead concentrations ≥ 400 ppm in soil (see Appendix A and Appendix F). Atlantic Richfield will conduct a maximum of 3 mailings plus telephone calls or home visits to attempt to contact eligible landowners to obtain access agreements for sampling. All other residences within the ADLC SPAOD (including those residences previously remediated for arsenic) may request soil and attic dust sampling.

3. ISWPs - Following attic dust sampling, analyses and data evaluation (for both arsenic and lead), ISWPs will be created for those attics with dust concentrations ≥ 400 ppm lead and/or ≥ 250 ppm arsenic. The ISWP will detail the RD applicable to the attic. However, if electrical components are discovered in the attic that do not comply with applicable residential electrical codes (e.g., deteriorated knob and tube wiring), attic dust RA will not be conducted until the landowner agrees, in writing, to replace the out of date components. In the event that the landowner does not agree, in writing, to replace the out of date components, attic dust RA will not be conducted. The CS OU Attic Dust Remedial Action Decision Flow Chart (which is used to develop each ISWP) is located on Figure 8.

4. RA – Once Attic Dust ISWPs are developed and approved by the Agencies, Atlantic Richfield will pursue construction access agreements and proceed with RA activities.

   a. For those attics subject to RA, an Atlantic Richfield representative will meet with the property owner to discuss the ISWP, the project schedule, and any concerns that the property owner may have.

   b. Trained and qualified contractors (typically asbestos abatement contractors) will conduct the RA in accordance with the procedures adopted by Atlantic Richfield. During RA, the QA/QC construction oversight representative will observe, inspect and evaluate the contractor's compliance with this plan and all applicable performance standards. Any deviations from this Work Plan will require approval by the Agencies through the RFC process.

   c. Contaminated insulation and debris in the attic will be removed, double bagged and disposed of within an appropriate disposal facility approved by EPA. Six-mil thick polyethylene sheeting will be temporarily installed while RA within an attic is conducted, to act as a barrier between the attic and living spaces at the point of access. All items that can be removed from the attic that the property owner does not want discarded will be removed and decontaminated.

   d. Attic dust RA will consist of negative pressure dust removal/disposal (via a remediation-grade/High-Efficiency Particulate Air [HEPA] filter vacuum) followed by application of a continuous layer of flame-retardant, penetrating encapsulant over all attic surfaces after dust removal is complete. If electrical components that do not comply with applicable residential electrical codes are discovered in the attic prior to dust removal (e.g., deteriorated knob and tube wiring), attic dust RA will not be conducted until the landowner agrees, in writing, to replace the out of date components. In the event that the landowner does not agree, in writing, to replace the out of date components, attic dust RA will not be conducted.

e. Abatement of asbestos-containing materials is not intended to be included as part of the attic dust program. If materials suspected to contain asbestos are encountered in an attic and would be disturbed by the RA, an inspection and sampling of these materials will be conducted. The samples will be collected by an accredited asbestos inspector and analyzed by an accredited asbestos laboratory. The quantity and location of the samples will be determined by site conditions. If the materials in question are determined to be a non-asbestos containing material (i.e., less than 1% asbestos), then the dust abatement activities may proceed. If the materials in question are determined to be asbestos containing material (i.e., greater than 1% asbestos), then an alternative plan will be developed, in coordination with the Agencies.

f. Any insulation removed during RA will be replaced by Atlantic Richfield. If asbestos-containing insulation is present and is not intermingled with dust from the attic space, the landowner will be responsible for removing the insulation before dust RA occurs. If the property owner plans construction activities that include removing insulation or installing new insulation in an attic, the cost of the new insulation is the responsibility of the property owner. The property owner will be responsible for any other remodeling work and costs.

g. Contaminated by-products of the RA process (soils/dust, filters, bags, insulation, debris, tags, etc.) will be disposed of within an appropriate disposal facility approved by Atlantic Richfield, and in compliance with all applicable regulations.

h. If both attic dust and residential soil RA is required at the same residence, an effort will be made to conduct the residential soils RA first to minimize the possibility of tracking non-remediated yard soil into the residence.

5. Project Data – All project data (including attic dust sampling results, ISWPs, As-Builts, etc.) will be uploaded into the CS OU database and GIS for future tracking and use.

5.3 Exterior Lead Paint

Exterior lead paint will not be remediated under this design. Residential properties with suspected exterior lead paint will be identified by soil sampling field crews during sampling activities and referred to ADLC for follow up. An example lead paint notification letter is located in Appendix I. In an attempt to minimize the potential of recontamination of residential soils, the landowner will be given up to 12 months to abate the suspected lead paint in advance of RA. If the landowner chooses not to remove exterior lead paint in advance of RA, Atlantic Richfield will proceed with RA, but will not be responsible for addressing any recontamination of residential soils caused by exterior lead paint.

5.4 Area of Remedial Action

The CS OU AOC, as detailed by the CS OU ROD Amendment (EPA/DEQ, 2013), is considered to be the ADLC SPAOD (Figure 1). Atlantic Richfield will submit an access agreement to each residence where existing lead concentrations in soils are ≥ 400 ppm lead. Other residences within the ADLC SPAOD may request soil sampling. A questionnaire (located in Appendix H) will be attached to the access agreement requesting information from the landowner regarding the presence of sensitive populations within the home (i.e., pregnant women and/or children 12 years of age or younger). This information will be used to aid in prioritizing residential yards for sampling. The highest priority for sampling will be given to residences with the highest lead concentrations in conjunction with presence of sensitive populations.

5.5 Landowner Communication

Following evaluation of existing soil lead data sets, sampling access agreement letters will be sent by Atlantic Richfield to residences with lead concentrations ≥ 400 ppm. If access for sampling is refused, the property will be entered into the GIS database as "No Access." Costs for future sampling of the property will be the responsibility of the landowner (unless there has been a property ownership change and the request is made by the new owner). If future sampling of a property where access was refused under this design indicates that RA is required, RA costs will then be the responsibility of the landowner (unless there has been a property ownership change).

Following validation of CS OU RD sampling results, Atlantic Richfield will send either a "No Action" or a "Remedial Action" letter to each landowner containing all sample results. A "No Action" letter will provide the appropriate arsenic and lead sample results (for either soil or attic dust) and will indicate that the attached arsenic and lead levels for the property do <u>not</u> exceed the residential action level; and therefore, no further action is required on the property. A "No Action" letter will also indicate that any future development activities at the site must comply with the ADLC DPS.

A "Remedial Action" letter will provide the appropriate arsenic and lead sample results (for either soil or attic dust) and will indicate that further RA is required on the property. The letter will indicate that future correspondence can be expected from Atlantic Richfield in the form of a construction access agreement letter along with an ISWP outlining sample results and proposed RA activities on the property for landowner review and concurrence. Example sample results letters are located in Appendix J.

Upon completion of soil and/or attic dust RA at each applicable CS OU residential property, landowners will be encouraged to inspect their property and indicate whether the work has been completed to their satisfaction. If the work is not satisfactory, the contractor will be directed to repair any areas of concern related to the construction work. Upon approval by the landowner, the landowner will be encouraged to sign a "Statement of Completion" to acknowledge that the work was completed to their satisfaction and in accordance with the ISWP. The EPA oversight personnel and Atlantic Richfield Project Manager will also sign the Statement of Completion to validate that the work was completed in accordance with regulatory requirements.

5.6 RD Data Collection Activities

The RD sampling associated with CS OU residential soils and attic dust is detailed in the two sections below as well as in the QAPP located in Appendix E.

5.6.1 Residential Soil Sampling

Residential soil sampling will be conducted in accordance with the Residential Soils/Dust QAPP (Appendix E). Atlantic Richfield will submit an access agreement to each residence where existing screening-level lead concentrations in soils are $\geq$ 400 ppm lead. Atlantic Richfield will conduct a maximum of 3 mailings, plus, if necessary, telephone calls or home visits to attempt to contact eligible landowners to obtain access agreements for sampling. A questionnaire (located in Appendix H) will be attached to the access agreement requesting information from the landowner regarding the presence of sensitive populations within the home (i.e., pregnant women and/or children 12 years of age or younger) as well as age of the home and activities/circumstances that may result in exposure to attic dust. This information will be used to aid in prioritizing residential yards for sampling. The highest priority for sampling will be given to residences with the highest lead concentrations in conjunction with presence of sensitive populations.

Residences with screening level lead data in soil below the 400 ppm action level, residences that have been sampled previously but have no lead data available, and residences within the ADLC SPAOD that have not been sampled previously may request sampling of their soil and attic dust. The residential yard area will be defined by the property boundary or a maximum of 125 feet from the exterior of the residence, unless a barrier (i.e., fence, hedge, tree line, abrupt change in grade, etc.) is encountered at a distance less than 125 feet. The 125-foot distance is considered a guideline and can be adjusted in the field by Agency personnel as appropriate.

Residential properties with obvious or suspected exterior lead paint will be identified during soil sampling activities by the sampling crew. These properties will be referred to ADLC for follow up. Sampling crews will also note any areas on adjacent properties that are readily available and frequented by children. If any such areas are noted, access agreements for sampling will be pursued from the appropriate landowner.

One soil subsample per individual yard component will be collected unless the component is greater than 625 square feet (ft^2) (25 feet by 25 feet) in surface area. If the yard component exceeds 625 ft^2, additional subsamples will be collected to meet the sample collection density of 1 subsample for each 625 ft^2. However, a maximum of eight soil subsamples will be collected from any individual residential yard, school, park, etc., component regardless of the surface area of that component. Larger parcels, such as schools, may require multiple components to ensure protectiveness.

Consistent with the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003a), RA decisions applicable to removing soils with lead concentrations ≥400 ppm, will be based on a component-specific basis. Samples will be collected at the 0 to 2-inch, 2 to 6-inch, and 6 to 12-inch depth intervals. Vegetable and flower gardens are the only yard components that will be sampled deeper than 12 inches (to include the 12 to 18-inch and 18 to 24-inch depth intervals). If an individual yard component and depth interval is ≤ 400 ppm lead, then that component is not subject to RA at that particular depth interval; however, individual components within the yard may still be subject to RA for arsenic. If an individual yard component and depth interval is ≥ 400 ppm lead, then that component is subject to RA for lead at the affected depth interval. Specific removal/replacement requirements will be identified in an ISWP.

Consistent with the original CS OU residential soils design, RA decisions applicable to removing soils with arsenic concentrations ≥ 250 ppm, will be based on a total yard AWA basis. For residences that were previously sampled under the original CS OU design, AWA arsenic concentrations were already calculated for the 0 to 2-inch depth interval; consequently, samples collected from the 0 to 2-inch depth interval under this design will be analyzed for lead only (not to include arsenic). An AWA arsenic concentration will not be recalculated for this depth interval. However, AWA arsenic concentrations will be calculated for 2 additional depth intervals (2 to 6 inches and 6 to 12 inches). Any clean cover soil in previously remediated components will not be resampled under this design, but will be assigned an average arsenic concentration of 19.1 ppm, which is the average arsenic concentration measured in the 100 Type A borrow soil samples collected during the previous CS OU RA (see Table 1). This approach is consistent with the Data Quality Objectives and acknowledges the clean soil in components previously remediated.

For residences that were not previously sampled under the original CS OU design, AWA arsenic concentrations will be calculated for all 3 depth intervals (0 to 2 inches, 2 to 6 inches, and 6 to 12 inches). If the AWA arsenic concentration is ≤ 250 ppm in all layers, then no arsenic-specific RA will be performed in that residential yard; however, individual components within the yard may still be subject to RA for lead. If the AWA arsenic concentration is ≥ 250 ppm within any layer, then each individual yard component within the affected layer ≥ 250 ppm arsenic will be subject to RA. Specific removal/replacement requirements will be identified in an ISWP.

Vegetable and flower gardens are the only yard components that will be sampled deeper than 12 inches (to include the 12 to 18-inch and18 to 24-inch depth intervals). Additionally, RA decisions for vegetable and flower gardens for arsenic will not be based on an AWA calculation. Similar to lead, RA decisions for vegetable and flower gardens for arsenic will be determined on a component-specific basis.

Drip zones within a given residence will not be treated as independent components. Subsamples will be collected from drip zones and will be included in the nearest component's composite sample. If that component's composite sample exceeds either the arsenic or lead action level, the drip zone will be remediated along with the remainder of the component. However, remediation on a drip zone due to arsenic will only occur when the AWA of the entire yard (at either the 0 to 2-inch depth interval, 2 to 6-inch depth interval, or 6 to 12-inch depth interval) exceeds the action level.

Soil samples will not be collected from directly beneath tree canopies. If the yard component surrounding the tree is subject to RA, soil excavation under the tree canopy will not be completed.

Sampling and RA applicable to alleys will be limited to a depth of 6 inches. Alleys are well compacted with infrequent exposure by residents and are unlikely to be excavated by hand tools by residents to a depth beyond 6 inches. Additionally, a GUS permit is required for mass excavation in alleys that may be performed by ADLC personnel and contractors; consequently, potential exposure to deeper soils in alleys will be addressed through ICs.

Those alleys which have not been subject to RA previously for arsenic, and with screening level lead data in soil ≥ 400 ppm, will be resampled for lead to determine the need for RA. Alley samples will not be analyzed for arsenic because RA decisions based on arsenic concentrations have already been made. Alley subsamples will be collected from each end of the alley and at one location between the ends of the alley, for a total of three subsamples. The three alley subsamples will be combined into one composite sample per alley and submitted to the laboratory for analyses.

The residential soils and alley samples will be analyzed for arsenic and lead by an Atlantic Richfield Laboratory Management Plan (LaMP) certified laboratory. The laboratory will use standard laboratory procedures and methods to prepare and analyze the samples according to the methods and criteria identified in the QAPP (Appendix E).

5.6.2 Attic Dust Sampling

Attic dust sampling will be conducted in accordance with the Residential Soils/Dust QAPP (Appendix E). Access agreements for soil and attic dust sampling will be pursued for those residences with screening level lead data in soil ≥ 400 ppm. Atlantic Richfield will conduct a maximum of 3 mailings to attempt to contact eligible landowners to obtain access agreements for sampling. Residences with screening level lead data in soil below the 400 ppm action level, residences that have been sampled previously but have no lead data available, and residences within the ADLC SPAOD that have not been sampled previously may request sampling of their soil and attic dust. In order to be eligible for attic dust sampling, the home must have been constructed prior to 1980 and meet at least one of the following conditions (subject to confirmation by Atlantic Richfield, as appropriate):

1. The attic is used as living space;

2. On average, the resident(s) enters the attic more than once per week;

3. The ceilings in the living space immediately below the attic are in a condition of disrepair with obvious exposure to the attic; or

4. The resident has contacted ADLC (per CPMP public outreach programs) regarding concerns about attic dust, which may result from a home remodeling project.

If the above qualifications are met, attic dust samples will be collected. If the criteria are not met, then no exposure pathway to the attic exists and the attic does not pose an unacceptable risk to the residents.

Attic dust samples will be collected using the Micro-Vacuum Surface Dust Sampler. Attic dust sampling procedures will follow the *American Society for Testing and Materials (ASTM) D7144-05a: Standard Practice for Collection of Surface Dust by Micro-vacuum Sampling for Subsequent Metals Determination* (ASTM, 2006). The Micro-Vacuum Sampler is designed to collect dust using a nozzle attached to a filter holder (sampling cassette) that is connected to an air sampling pump. Depending on accessibility, samples will be collected from a minimum of two locations within the attic and composited into one representative sample.

Attic dust samples will be analyzed for arsenic and lead by an Atlantic Richfield LaMP certified laboratory. The laboratory will use standard laboratory procedures and methods to prepare and analyze the samples according to the methods and criteria identified in the QAPP (Appendix E).

5.7 Design and Implementation of RA Remedy

The final designs applicable to residential soils, alleys and accessible attic dust are summarized below.

5.7.1 Design and Implementation of Residential Soils and Alleys RA Remedy

A surveyed map was created for each individual property sampled during the original CS OU RA sampling investigation (residential yards and alleys). These maps identify how each residential property was divided into individual components (i.e., front yard, back yard, vegetable garden, etc.) and will be reused for this current CS OU design. All soil sample locations will be marked on each map and will subsequently be referred to as a “Sample Location Map.” Appendix D contains an example of a Sample Location Map. All Sample Location Maps will be submitted to the Agencies along with the annual Data Summary Report (DSR). In the event that a map does not exist for a particular residence, or the existing map is obsolete due to changes within a residential yard (landscaping, new structures, etc.), a new surveyed map will be created. The maps will be used to verify (or modify, as appropriate) the layout of each residential yard and will aid in guiding the soil sampling activities. Each map includes the following information:

- Layout and surface area applicable to each individual yard component (e.g., front yard, back yard, earthen driveway, flower garden, vegetable garden, etc.);

- Surface area applicable to the “occupation” boundary of each residence (approximately corresponding with the property boundary or a maximum of 125 feet from the exterior of the residence);

- House location;

- Garage location;
- Location of sidewalks, walkways, etc.;
- Location of miscellaneous structures (e.g., patios, concrete pads, sidewalks, decks, etc.); and
- Any noticeably dissimilar soil material types or surface conditions (i.e., bare ground areas, locations of obvious imported fill materials, etc.).

For those residences subject to RA, the surveyed map will ultimately be transformed into an ISWP. Appendix D contains an example ISWP. Each ISWP will include the following information:

- Soil sampling results (lead and arsenic) applicable to each component at each depth interval;
- Arsenic AWA for each depth interval;
- RA requirements (i.e., individual components subject to removal/replacement and to what depth); and
- RA material quantities (soil, sod, aggregate, etc.).

During residential soil sampling, field crews will note residential properties with obvious or suspected lead paint. These properties will be referred to ADLC for follow up. In an attempt to minimize the potential of recontamination of residential soils, the landowner will be given up to 12 months to abate the suspected lead paint in advance of RA. If the landowner chooses not to remove exterior lead paint in advance of RA, Atlantic Richfield will proceed with RA, but will not be responsible for addressing any recontamination of residential soils caused by exterior lead paint.

Arsenic and lead soil sampling information and corresponding locations/survey data, sample location maps, ISWPs and As-Built Drawings will be maintained in the CS OU database and GIS for tracking and future reference.

5.7.1.1 Soil Covers

Soil covers and vegetative caps will be placed as shown on the Standard Drawings (Appendix D). In general, soil backfill will be placed to a depth matching the excavation depth and will be graded to match the surrounding ground surface/topography. Backfill in areas specified for sod cover or seeding will not be compacted for a specific density and moisture content, but will be rolled and slightly compacted using small, hand-operated equipment to achieve a smooth surface that matches the surrounding topography. The surfaces of backfilled areas will be prepared (hand raked) in such a manner that they are amenable to sod placement (i.e., smooth, not overly steep, no abrupt edges, etc.). Sod will then be placed over the backfilled area. Upon request from the landowner, or if the landowner elects to not maintain the sod cover, native seed may be used as an alternative vegetated cover in areas (especially in regional residential yards).

5.7.1.1.1 Borrow Areas

Borrow materials will be required under this RA to provide backfill in excavated areas, embankment fill, and surfacing on driveways, walkways, and other paddock areas. Soils suitable as vegetative growth media is referred to as Type A soil throughout the Anaconda Smelter NPL Site. Type A soil will be obtained from an Agency-approved borrow source(s) and will meet all cover soil suitability criteria (see Table 2). The Type A source will be monitored on an ongoing basis, as specified in the CQAP (Appendix B), to ensure that the cover soil criteria are maintained throughout the project. Soil used as general backfill in excavated areas not subject to revegetation is referred to as Type B soil. Type B soil consists of coarse structural fill and does not necessarily meet all cover soil suitability criteria (most notably soil texture). Type B soil is placed and compacted in beneath specified aggregates in earthen driveways, rock gardens, alleys, and similar areas. Type B soil will also be obtained from an Agency-approved borrow source(s).

5.7.1.2 Aggregate Covers

Aggregate covers will be used in alleys and within certain residential yard components (e.g., earthen driveways and walkways, alleys, rock gardens, etc.). All areas specified to receive aggregate covers will be excavated to a minimum depth of 6 inches. Areas excavated deeper than 6 inches and specified to receive aggregate covers, will be backfilled and compacted using Type B soil to a depth of 6 inches beneath the surrounding ground surface. The upper 6 inches of the excavation will then be backfilled and compacted using specified aggregates.

Specified aggregates for alleys, compacted embankments and driveway/walkway surfacing will be obtained at the contractor's discretion. Submittals, which provide appropriate materials data, will be required to assure that all materials meet the project specifications.

5.7.1.3 Revegetation

Under this design, revegetation will consist of placing sod or application of native seed. Unless otherwise specified by the landowner, revegetation for in-town properties will consist of sod application following backfill and grading work. Where appropriate within regional residential yards, revegetation will consist of seeding as opposed to sod application. Grading is also an integral component of revegetation. The vegetative cover, once established, is designed to minimize surface erosion by wind and water. Sod application methods are detailed in the Technical Specifications (Appendix C) and are shown on the Standard Drawings (Appendix D).

5.7.1.4 Construction Transportation Plan

The CS OU RA activities will require transport of relatively large quantities of excavated materials, borrow soil, sod, and construction materials through residential streets in Anaconda as well as on county roads and public highways. Transportation methods and routes will be determined by the earthwork contractor. All materials transported will require street legal haul trucks.

Work zone access will be restricted to authorized personnel only. Construction haul routes will be determined by the earthwork contractor to maximize safety and efficiency. Proposed haul routes are subject to approval by Atlantic Richfield and the Agencies. The contractor will coordinate any necessary local road closures with ADLC.

Appropriate signage will be posted to route construction traffic and to inform and re-route the public, as necessary. Although significant encroachment on major streets or roads is not anticipated, flaggers will be used, as necessary, to control traffic in confined areas. A Construction Transportation Plan, including anticipated haul routes and associated traffic control, will be required of the contractor prior to implementing the RA. The Construction Transportation Plan may be part of the contractor's site-specific Health and Safety Plan, and will be submitted to Atlantic Richfield for approval.

5.7.1.5 Disposal Area

All impacted materials generated during CS OU RA activities will be hauled to and disposed within an appropriate disposal facility approved by EPA.

5.7.2 Design and Implementation of Attic Dust RA

Any insulation removed during RA will be replaced by Atlantic Richfield.

In order to be eligible for attic dust sampling, the home must have been constructed prior to 1980 and meet at least one of the following conditions (subject to confirmation by Atlantic Richfield, as appropriate):

1. The attic is used as living space;

2. On average, the resident(s) enters the attic more than once per week;

3. The ceilings in the living space immediately below the attic are in a condition of disrepair with obvious exposure to the attic; or

4. The resident has contacted ADLC (per CPMP public outreach programs) regarding concerns about attic dust, which may result from a home remodeling project.

If the above qualifications are met, attic dust samples will be collected (see Section 5.6.2). If the criteria are not met, then no exposure pathway to the attic exists and the attic does not pose an unacceptable risk to the residents.

Individual Site Work Plans will be created for those attics with dust concentrations $\geq$ 400 ppm lead and/or $\geq$ 250 ppm arsenic. The ISWP will document the attic dust sampling results and detail the RD applicable to the attic. Appendix D contains an example of an attic dust ISWP. The ISWPs will be provided to the Agencies for review and approval prior to construction. For those attics subject to RA, an Atlantic Richfield representative will meet with the property owner to discuss the ISWP, the project schedule, and any concerns that the property owner may have.

If electrical components are discovered in the attic that do not comply with applicable residential electrical codes (e.g., deteriorated knob and tube wiring), attic dust RA will not be conducted until the landowner agrees, in writing, to replace the out of date components. In the event that the landowner does not agree, in writing, to replace the out of date components, attic dust RA will not be conducted.

Attic dust RA will consist of negative pressure dust removal/disposal (via a remediation-grade/HEPA filter vacuum) followed by application of a continuous layer of flame-retardant, penetrating encapsulant over all attic surfaces after dust removal is complete. Attic dust confirmation sampling will be performed following RA in accordance with the *Lead Dust Sampling Technician Field Guide, EPA-W-04-022* (EPA, 2009) located in the QAPP.

Confirmation sampling will consist of sampling the encapsulation material on the attic surfaces. If confirmation sampling indicates that the lead residual lead concentration is $\geq$ 40 micrograms per square foot ($\mu g/ft^2$), the penetrating encapsulant will be re-applied followed by another round of confirmation sampling.

Arsenic and lead attic dust sampling information and corresponding ISWPs will be maintained in the CS OU database and GIS for tracking and future reference.

5.8 Historic Preservation

Historic preservation requirements are being addressed at the CS OU through the Programmatic Agreement (PA) that was signed by 8 affected parties in April 1992, and modified in the Final Second Programmatic Agreement (SPA) dated September 14, 1994.

It is anticipated that no additional historic features will be identified within the project area during RA; however, if features are identified, and pursuant to applicable or relevant and appropriate requirements (ARARs), the following procedures will be initiated:

1. Atlantic Richfield and Agency construction oversight personnel will be immediately contacted.

2. Atlantic Richfield’s Project Manager will be immediately contacted by Atlantic Richfield’s construction oversight personnel.

3. RA activities in the immediate vicinity of the identified feature will be halted. Construction elsewhere on the project may continue.

4. The requirements of the Regional Historic Preservation SPA will be met.

5.9 Maintenance and Monitoring Procedures

This section identifies routine property maintenance activities for areas reclaimed under this Residential Soils/Dust RAWP/FDR. The EPA acknowledges that certain property maintenance activities, which partially overlap with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)-required maintenance activities, will be the responsibility of each landowner for property owned or controlled within the CS OU either under independent state or local law or by agreement between Atlantic Richfield and the landowner. Upon request from Atlantic Richfield, the EPA may assist Atlantic Richfield in obtaining landowner cooperation and agreement to carry out required maintenance. Monitoring activities will be conducted by Atlantic Richfield.

Monitoring activities include the following:

- Qualitative inspections;
- ICs; and
- Record Keeping.

Maintenance activities include the following:

- Noxious weed control;
- Vegetation maintenance; and
- Storm water maintenance.

At the CS OU, landowners are expected to perform noxious weed control, routine vegetation maintenance, site security, and storm water run-on/runoff ditch refuse cleaning. Atlantic Richfield will perform weed management, as necessary, along haul routes disturbed by Atlantic Richfield to access remote residences for RA activities. In areas where seeding is performed, Atlantic Richfield will perform supplemental seeding within failed revegetation areas, for up to two growing seasons.

Landowners whose property receives new sod application as part of the RA will be provided a pamphlet that describes appropriate sod maintenance procedures. The ADLC DPS will be used to permit all future development activities within ADLC and the developer and/or landowner is responsible for implementation and operation and maintenance of any actions taken through the ADLC DPS.

5.10 Institutional Controls

All ICs required pursuant to the CS OU ROD (EPA, 1996) and the CS OU ROD Amendment (EPA/DEQ, 2013) will be addressed through the pending Anaconda Smelter NPL Site ICIAP CPMP.

5.11 Environmental Monitoring

5.11.1 Air Monitoring

Historical data collected at the Anaconda Smelter site during previous RA work show that COC concentrations in the air are well below Permissible Exposure Limits (PELs). Therefore no ambient or worker air monitoring is anticipated to be required by the Agencies during the CS OU RA.

5.11.2 Dust Control

Best Management Practices (BMPs) to minimize fugitive dust emissions will be implemented during all RA activities. Dust control measures may include, but not be limited to, applying a water spray to dust generating areas and covering loads during transport to and from the excavation area and disposal area.

If fugitive dust emissions become significant during the course of the work, as determined by the Atlantic Richfield on-site representative or the Agencies, all work will be shut down until alternative and satisfactory dust control measures are approved by the Atlantic Richfield representative and the Agencies.

6.0 REPORTING AND RECORD KEEPING

Atlantic Richfield will be responsible for producing monthly progress reports, annual DSRs, RA Construction Completion Reports (CCRs), and an RA Completion Report for submittal to the Agencies to track the progress of all CS OU activities. Reporting and record keeping requirements are detailed in the following two sections.

6.1 Construction Reporting

The construction contractor will record the following information on a daily basis, when applicable:

- On-site equipment and personnel;
- Safety incidents, including preventative measures implemented;
- Materials delivery and usage;
- QA/QC on specified materials; and
- Laboratory analytical results on construction materials per the technical specifications (Appendix C).

The QA/QC oversight personnel will perform various recordkeeping duties and will be responsible for maintaining a complete and accurate record of all significant field observations, inspections and all field and/or laboratory testing and results as outlined in the CQAP (Appendix B).

Atlantic Richfield will submit a monthly report summarizing activities during performance of the RA. This monthly progress report will be submitted by the tenth day of each month. The monthly report will generally follow the format of other RA monthly progress reports. It is anticipated that the monthly report will include the following:

- Lists of residents contacted (through letters, phone calls and interviews);
- Lists of residents scheduled for sampling;
- Lists of residents where access has been refused for DPS tracking;
- A projected sampling schedule for forthcoming work activities;
- A projected construction schedule for forthcoming work activities; and
- RFCs and Requests for Information (RFIs) and other submittals.

6.2 Record Keeping

Because of the large number of landowners and land units that may potentially be affected by this RA, the project database to track sampling data and RA is a critical component of this project. The current CS OU database already contains all data generated during the original CS OU RD and RA activities. As additional data are generated going forward, it will be added to the original data in the CS OU database. Specific procedures and requirements for managing the new data will be as defined in the pending Anaconda Smelter NPL Site Data Management Plan.

Additionally, all residential soil and attic dust sampling data, ISWPs, as-built drawings, etc., will be uploaded annually into the GIS (following approval of all information by the Agencies). It is anticipated that the GIS will be made available to the local, state, and federal agencies on a continuous basis throughout the entire project.

At the conclusion of CS OU RA activities, all RA data will be provided for inclusion into the GIS. The CS OU portion of the GIS will be finalized for use by local, state, and federal agencies.

7.0 REMEDIAL ACTION SCHEDULE

Residential soil and attic dust sampling activities will be initiated following approval of this RAWP/FDR. Access agreements for soil and attic dust sampling will be mailed to those residences where existing screening-level lead concentrations in soils are $\geq$ 400 ppm, as well as to those residents that have requested sampling. A questionnaire (located in Appendix H) will be attached to the access agreement requesting information from the landowner regarding the presence of sensitive populations within the home (i.e., pregnant women and/or children 12 years of age or younger) as well as age of the home and activities/circumstances that may result in exposure to attic dust. This information will be used to aid in prioritizing residential yards for sampling. The highest priority for sampling will be given to residences with the highest lead concentrations in conjunction with presence of sensitive populations. Following receipt of completed access agreements, surveying of individual residences (if necessary) and sampling will be scheduled.

Soil and dust sampling requests will be accepted until December 31, 2020. Past this date, additional sampling requests will be addressed by Atlantic Richfield or its contractor in accordance with the requirements of the ICIAP..

After data validation activities are complete, results for all analyses (arsenic and lead) will be reported to each individual landowner. Remedial action will be initiated following approval of the ISWPs by the Agencies, and executed RA access agreements are received. The schedule is intended to allow the CS OU sampling and RA program to be subject to an Agency 5-year review.

8.0 REFERENCES

ASTM, 2006. American Society for Testing and Materials (ASTM) D7144-05a: Standard Practice for Collection of Surface Dust by Micro-vacuum Sampling for Subsequent Metals Determination.

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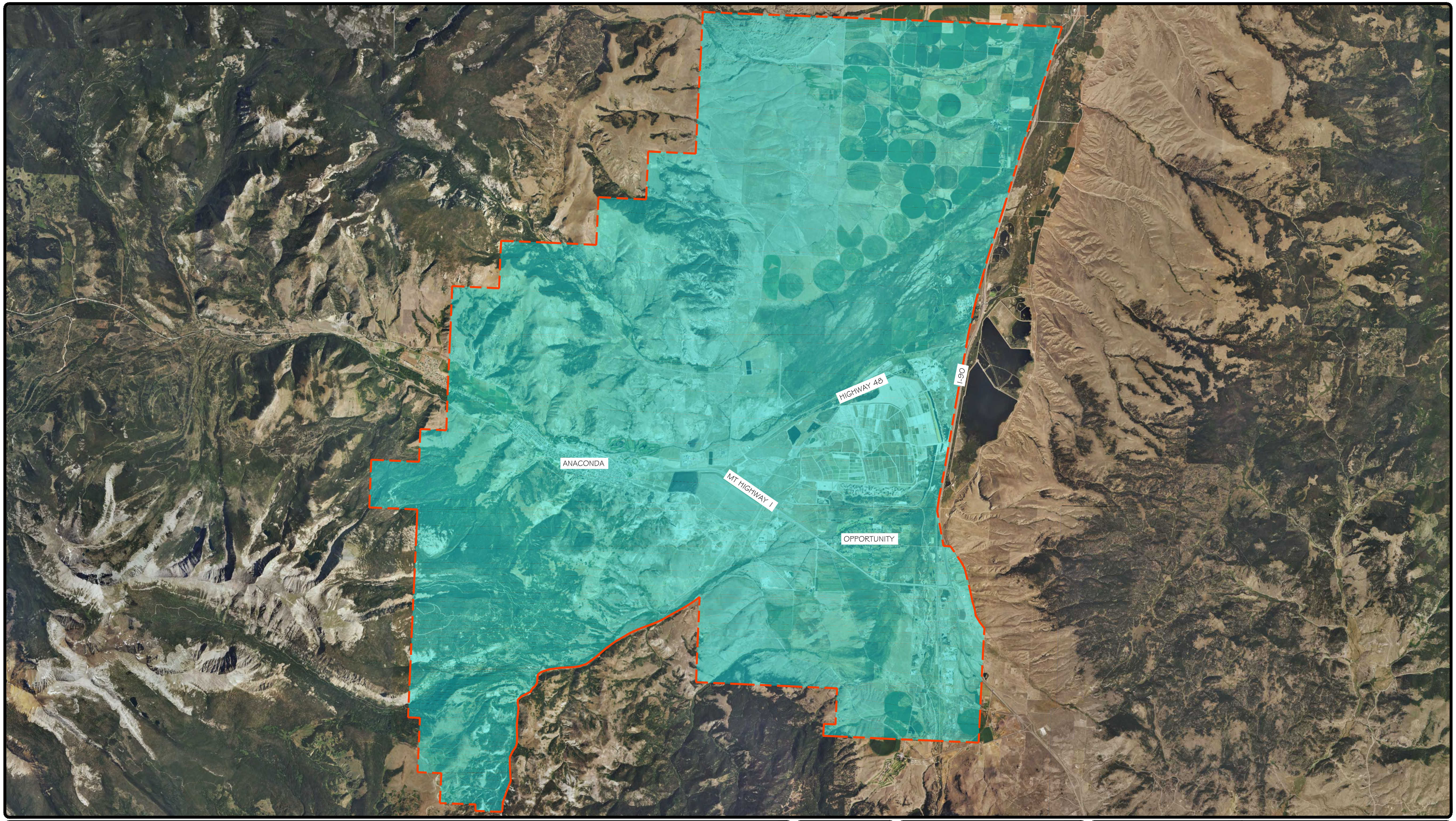
FIGURES



ADLC SUPERFUND PLANNING AREA OVERLAY DISTRICT (SPAOD)

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UNITS:	FEET
SOURCE:	PIONEER- NAIP

SCALE IN FEET
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FIGURE 1

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

ADLC SUPERFUND PLANNING AREA OVERLAY DISTRICT (SPAOD)

DATE: 3/3/2015

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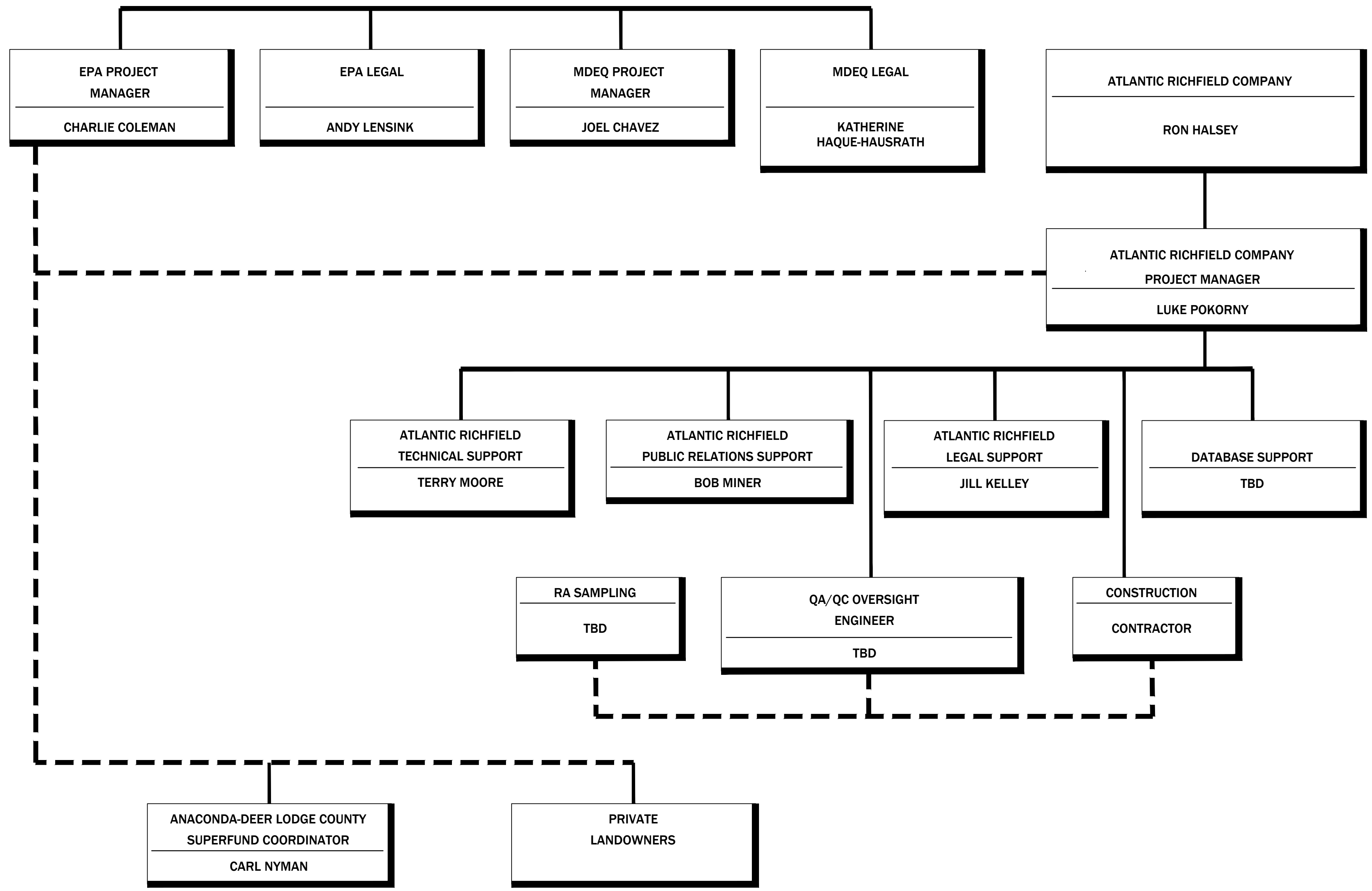

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COORD SYS/ZONE:	NA
DATUM:	NA
UNITS:	NA
SOURCE:	PIONEER

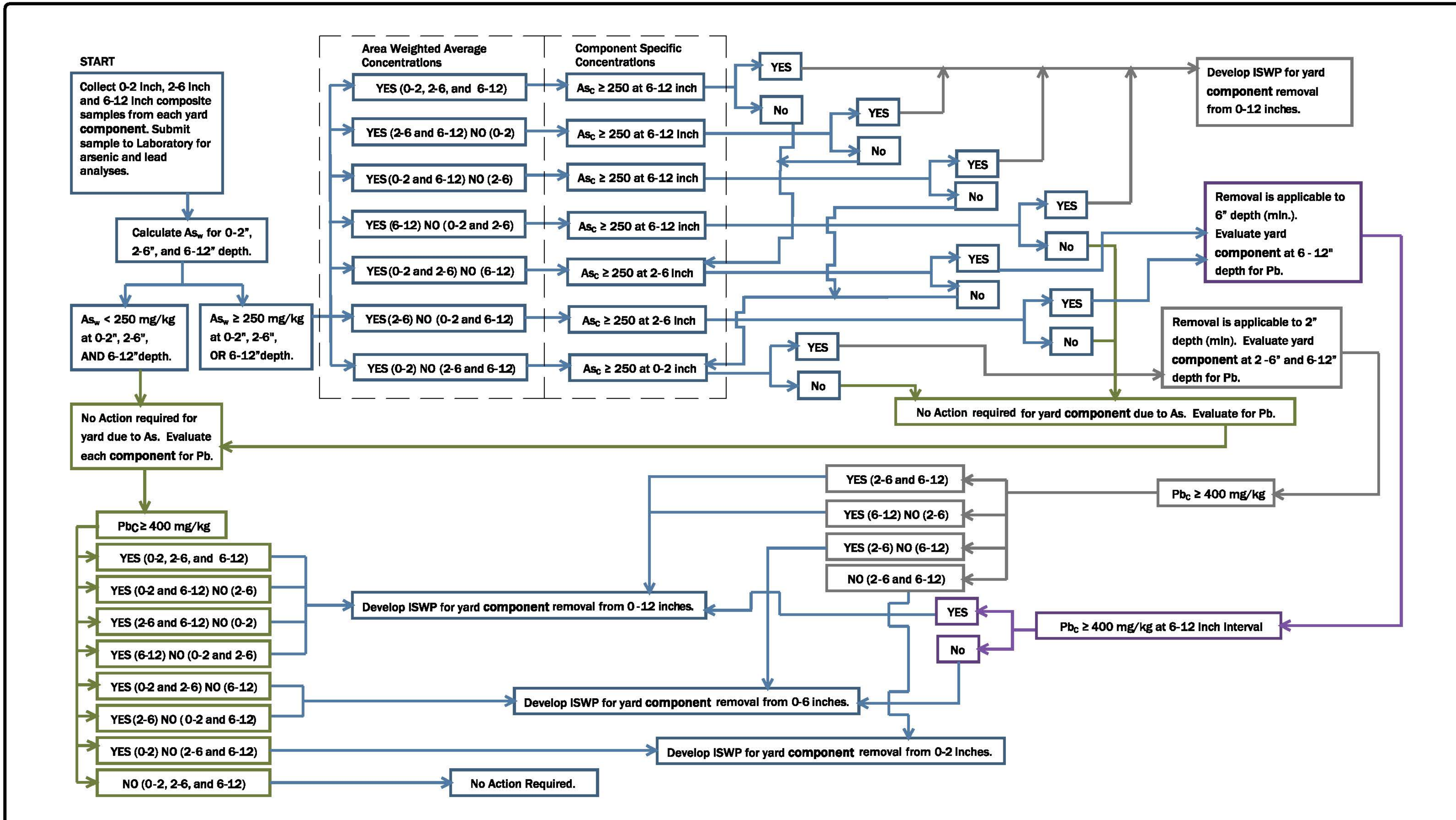
SCALE IN FEET
0 NTS NTS

FIGURE 2

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

CS OU ORGANIZATION CHART

DATE: 4/20/2015



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches, an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:
SCALE IN FEET
0 NTS NTS

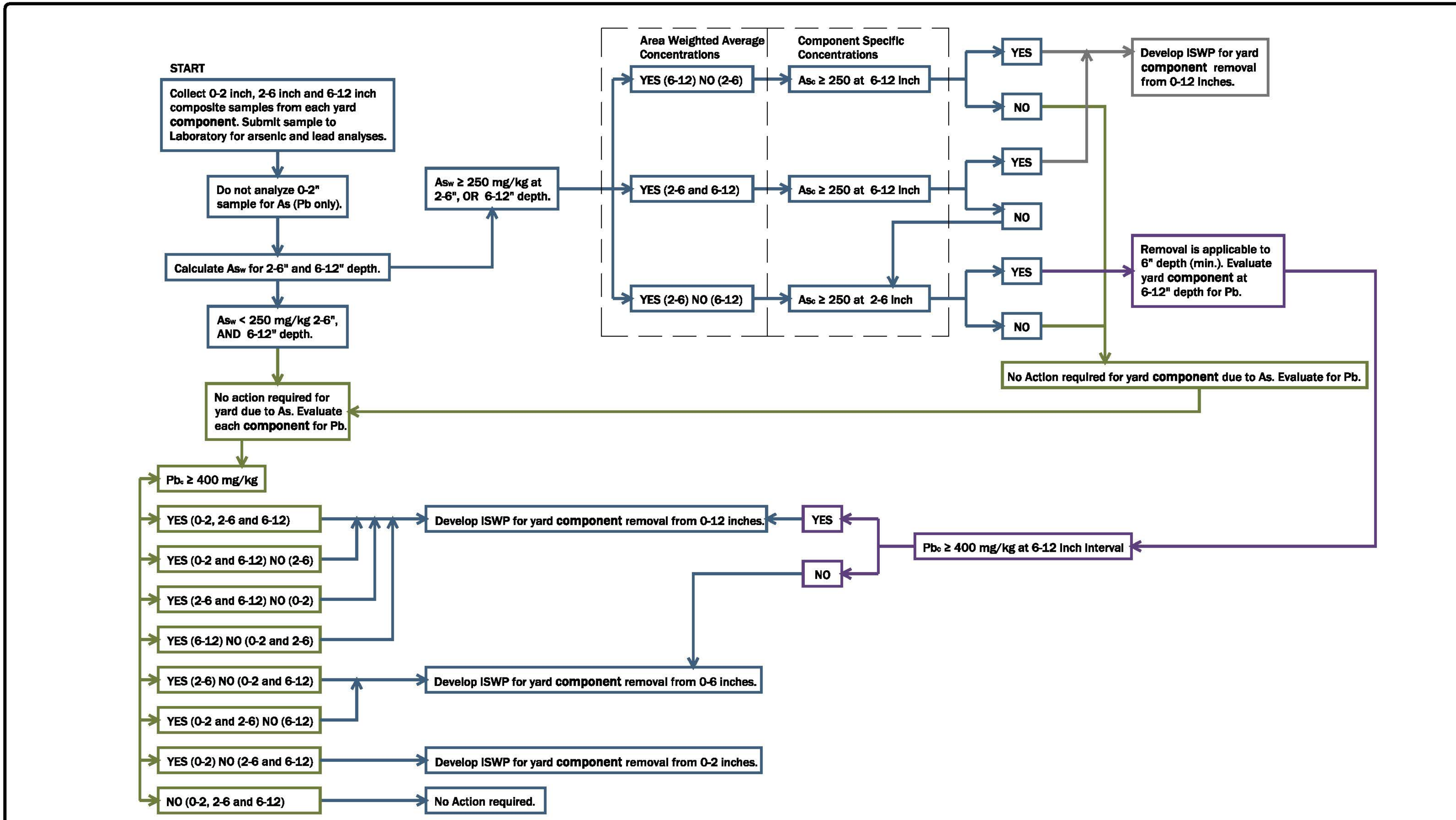
FIGURE 3

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

SAMPLING AND REMEDIAL ACTION FLOW CHART FOR RESIDENTIAL SOILS NOT PREVIOUSLY SAMPLED

DATE: 4/20/2015

4/20/2015 4:23:16 PM \\192.168.262.15\PROJECTS\ANADATA\AR\CSOU\2015\DOCUMENTS\DRAFT FINAL CS OU FDR (TO EPA 4-XX-15)\FIGURES\CSOU SAMPLING PLAN 3.DWG



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

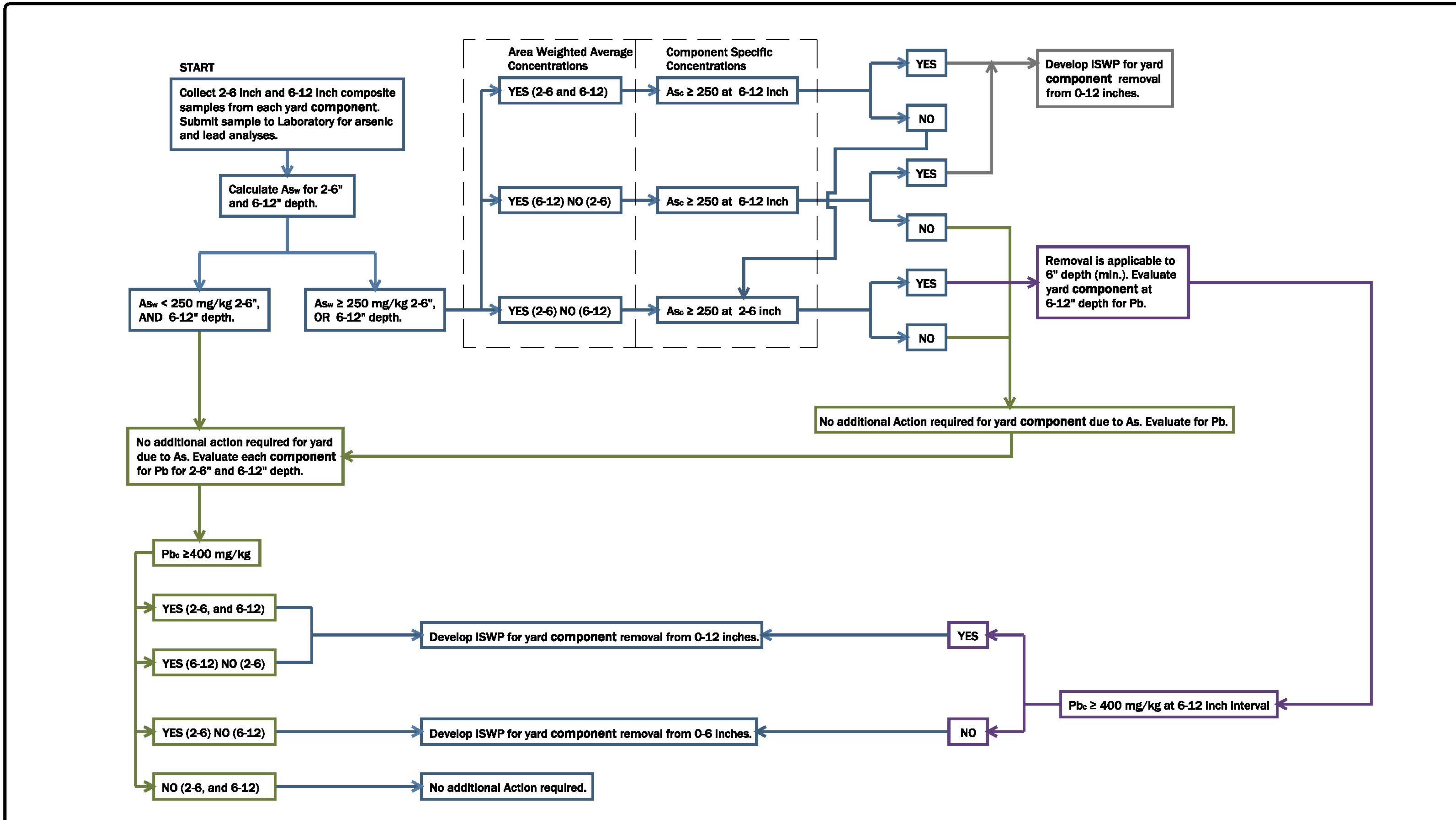
NOTES:
1. For those properties previously sampled at 0-2 inches, an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:
SCALE IN FEET
0 NTS NTS

FIGURE 4

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY SAMPLED BUT NOT SUBJECT TO RA
DATE: 4/20/2015



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
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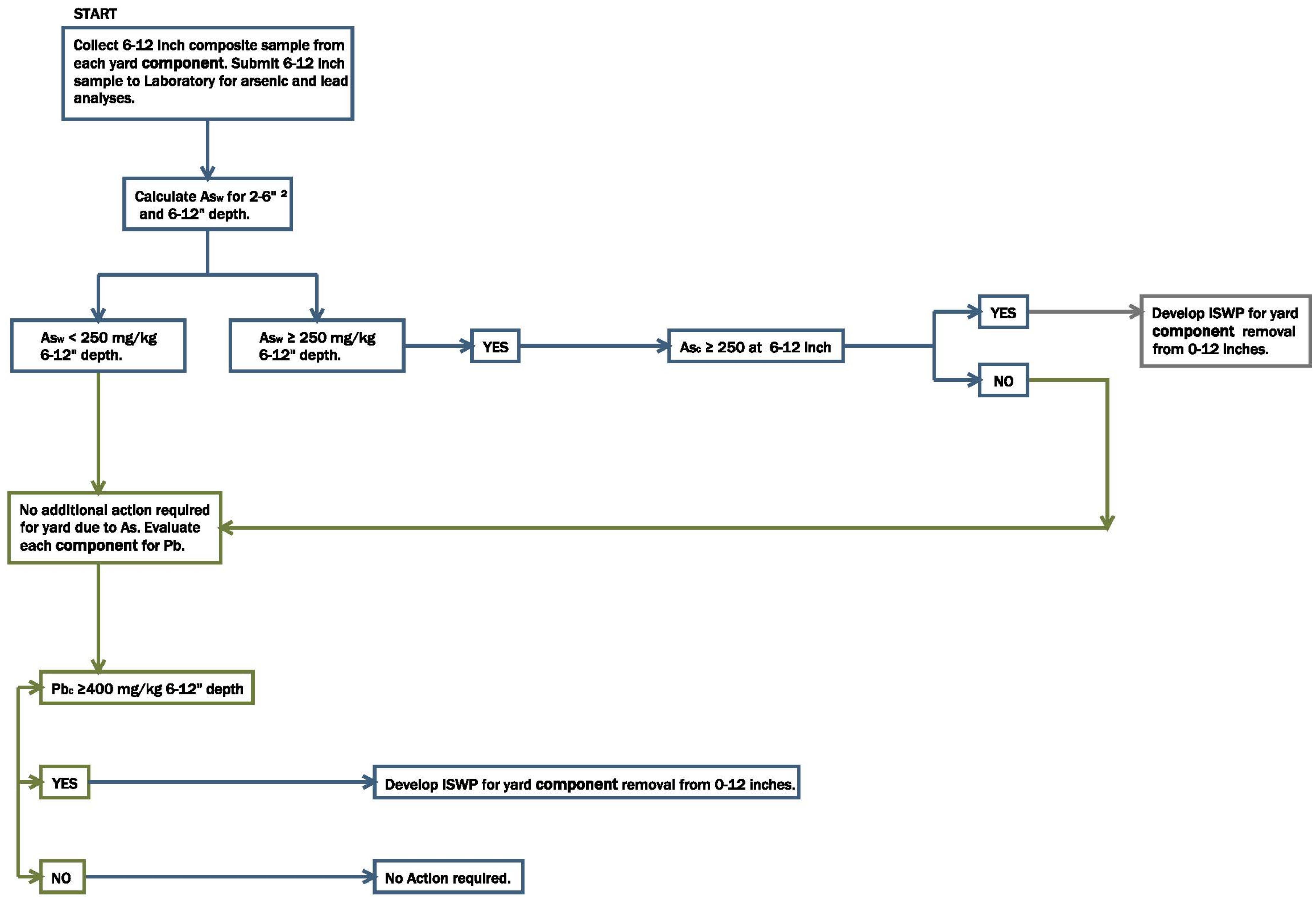
SOURCE:
SCALE IN FEET
0 NTS NTS

FIGURE 5

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY REMEDIATED AT 0" - 2" DEPTH

DATE: 4/20/2015



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. When calculating the arsenic area weighted average, in previously remediated components, an average arsenic concentration of 19.1 mg/kg will be applied to all previously placed clean cover soil.
3. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

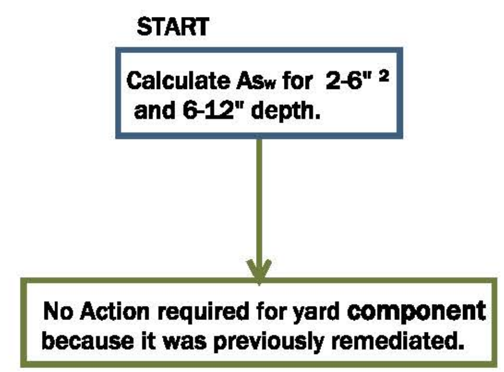
DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:
SCALE IN FEET
0 NTS NTS

FIGURE 6

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY REMEDIATED AT 0" - 6" DEPTH

DATE: 8/7/2015



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. When calculating the arsenic area weighted averages, in previously remediated components, an average arsenic concentration of 19.1 mg/kg will be applied to all previously placed clean cover soil.
3. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:

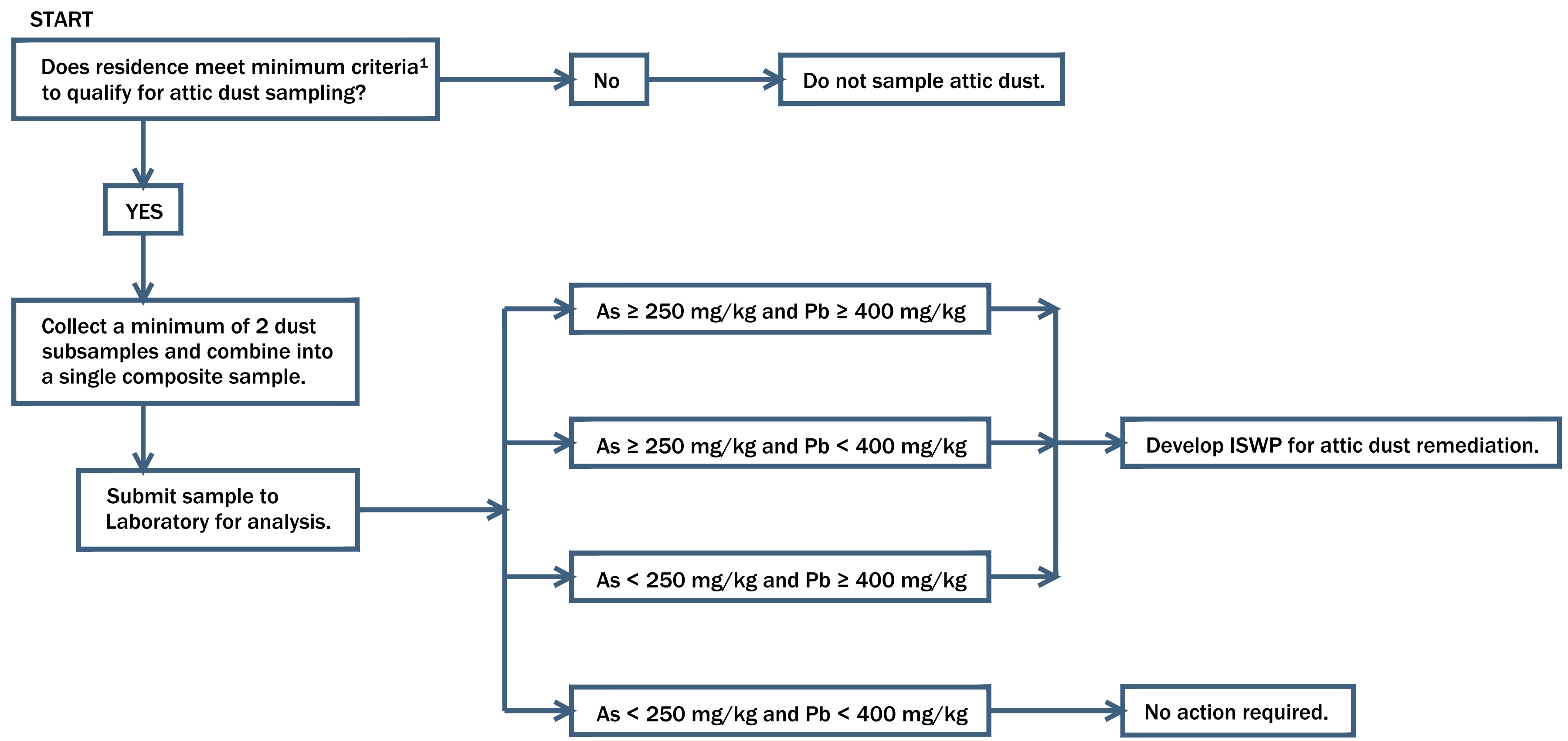
SCALE IN FEET
0 NTS NTS

FIGURE 7

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY REMEDIATED AT 0" - 12" DEPTH

DATE: 8/7/2015



LEGEND:

Pb: Lead

As: Arsenic

ISWP: Individual Site Work Plan

[1] - Criteria to qualify for attic dust sampling is detailed in RAWP/FDR text, Section 3.2 Attic Dust.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:

SCALE IN FEET
0 NTS NTS

FIGURE 8

SAMPLING AND REMEDIAL ACTION FLOW CHART FOR ATTIC DUST

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

DATE: 4/20/2015

TABLES

TABLE 1: Type A Borrow Soil Arsenic Concentration (2005 - 2010 CSOU RA)

SAMPLE ID	Arsenic (mg/kg)	Comment
05 - CMOU - 0505 - 001	29.3	
05 - CMOU - 0628 - 002	22.5	
05 - CMOU - 0628 - 003	11.3	
05 - CMOU - 0628 - 004	24.3	
05 - CMOU - 0628 - 005	19.3	
05 - CMOU - 0628 - 006	17.0	
05 - CMOU - 0628 - 007	13.3	
05 - CMOU - 0628 - 008	15.6	
05 - CMOU - 0628 - 009	22.9	
05 - CMOU - 0713 - 010	37.6	
05 - CMOU - 0713 - 011	12.3	
05 - CMOU - 0713 - 012	20.9	
05 - CMOU - 0713 - 013	17.0	
05 - CMOU - 0802 - 014	17.2	
05 - CMOU - 0802 - 015	12.8	
05 - CMOU - 0811 - 016	10.2	
05 - CMOU - 0811 - 017	13.6	
05 - CMOU - 0811 - 018	14.6	
05 - CMOU - 0811 - 019	22.4	
05 - CMOU - 0811 - 020	20.0	
05 - CMOU - 0811 - 021	26.7	
05 - CMOU - 0811 - 022	17.5	
05 - CMOU - 0811 - 023	26.7	
05 - CMOU - 0811 - 024	18.9	
05 - CMOU - 0811 - 025	19.0	
06 - CMOU - 0418 - 001	33.5	
06 - CMOU - 0418 - 002	31.3	
06 - CMOU - 0418 - 003	25.9	
06 - CMOU - 0418 - 004	21.3	
06 - CMOU - 0418 - 005	15.5	
06 - CMOU - 0419 - 006	4.9	
06 - CMOU - 0419 - 007	6.4	
06 - CMOU - 0419 - 008	4.9	
06 - CMOU - 0419 - 009	15.7	
06 - CMOU - 0420 - 010	9.7	
06 - CMOU - 0420 - 011	31.4	
06 - CMOU - 0420 - 012	6.8	

06 - CMOU - 0613 - 013	22.3	
06 - CMOU - 0613 - 014	17.2	
06 - CMOU - 0613 - 015	16.5	
06 - CMOU - 0613 - 016	16.1	
06 - CMOU - 0629 - 017	15.4	
06 - CMOU - 0629 - 018	17.6	
06 - CMOU - 0629 - 019	28.5	
06 - CMOU - 0629 - 020	27.0	
06 - CMOU - 0807 - 021	20.1	
06 - CMOU - 0807 - 022	9.9	
06 - CMOU - 0807 - 023	13.4	
06 - CMOU - 0807 - 024	20.5	
06 - CMOU - 0807 - 025	9.6	
06 - CMOU - 0807 - 026	14.4	
06 - CMOU - 0807 - 027	15.5	
06 - CMOU - 0807 - 028	10.5	
06 - CMOU - 0807 - 029	17.2	
06 - CMOU - 0807 - 030	19.8	
TYPE A-0805-CS-001	4.0	1/2 Detection Limit
SCREENED A-0805-CS-001	8.4	
TYPE A-0814-001	10.6	
TYPE A-0814-002	16.9	
TYPE A-0814-003	16.2	
TYPE A-0814-004	32.5	
TYPE A-0814-005	40.6	
TYPE A-0814-006	16.6	
TYPE A-0814-007	18.8	
TYPE A-0814-008	21.2	
TYPE A-0814-009	32.1	
TYPE A-0814-010	12.9	
09-TYPEA-1008-001 (Screened)	21.1	
09-TYPEA-1009-002 (Screened)	22.4	
09-TYPEA-1010-003 (Screened)	16.0	
09-TYPEA-1012-004 (Screened)	25.2	
09-TYPEA-1016-001 (UnScreened)	17.7	
09-TYPEA-1016-002 (UnScreened)	16.5	
09-TYPEA-1016-003 (UnScreened)	4.0	1/2 Detection Limit
09-TYPEA-1016-004 (UnScreened)	29.5	
09-TYPEA-1016-005 (UnScreened)	28.6	
09-TYPEA-1016-006 (UnScreened)	11.0	
09-TYPEA-1104-001	28.8	
09-TYPEA-1105-002	23.7	
09-TYPEA-1106-003	22.9	

09-TYPEA-1106-004	24.1	
09-TYPEA-1105-005	27.0	
09-TYPEA-1105-006	4.0	1/2 Detection Limit
09-TYPEA-1105-007	14.3	
09-TYPEA-1105-008	19.6	
09-TYPEA-1105-009	22.6	
09-TYPEA-1105-010	31.6	
09-TYPEA-1105-011	21.8	
10-TYPEA-0121-012	11.1	
10-TYPEA-0121-013	23.8	
10-TYPEA-0121-014	22.0	
10-TYPEA-0121-015	32.8	
10-TYPEA-0121-016	22.6	
10-TYPEA-0121-017	12.1	
10-TYPEA-0121-018	20.5	
10-TYPE B CS-1020-001	3.0	1/2 Detection Limit
10-TYPE B CS-1020-002	3.0	1/2 Detection Limit
10-TYPE A CS-1020-003	23.7	
10-TYPE A CS-1109-001	49.6	
10-TYPE A CS-1109-002	23.4	
COUNT	**100**	
AVERAGE	**19.1**	

TABLE 2: COVER SOIL SUITABILITY CRITERIA (TYPE A MATERIAL)

PARAMETERS	CRITERIA
Texture	(Cannot be sand, clay or loamy sand)
Rock Fragments	<45% by volume in the bank, 6-inch maximum rock diameter
Saturation Percentage	>25% and <85%
pH	>6.5 and <8.5 standard units
Electrical Conductivity	<4,000 umhos/cm with standard seed mix <6,000 umhos/cm for salt tolerant
Sodium Adsorption Ratio	<12 for root zone materials <20 for general fill
Total Elemental Concentration	
Arsenic	<100 mg/kg and approach 30 mg/kg
Cadmium	<4 mg/kg
Copper	<100 mg/kg
Lead	<100 mg/kg
Zinc	<250 mg/kg
Organic Matter	Minimum 1.5% (existing or added as determined by Walkley Black)

μmhos/cm = micromhos per centimeter
mg/kg = milligrams per kilogram

APPENDIX A

LIST OF PROPERTIES WITHIN THE CS OU
WITH SCREENING LEVEL AND ENFORCEMENT LEVEL (OPPORTUNITY)
LEAD CONCENTRATIONS IN SOILS ≥ 400 PPM LEAD

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
1	A-0001	N/A	30128503419030000	620 Alder	CSOU Screening Level Data	762
2	A-0004	N/A	30128503409040000	714 Alder	CSOU Screening Level Data	1,700
3	A-0006	N/A	30128503408020000	722 Birch	CSOU Screening Level Data	462
4	A-0009	N/A	30128503419190000	621 Birch	CSOU Screening Level Data	1,320
5	A-0010	N/A	30128503418020000	622 Birch	CSOU Screening Level Data	643
6	A-0012	N/A	30128503426210000	519 Birch	CSOU Screening Level Data	1,160
7	A-0013	N/A	30128503425080000	510 Birch	CSOU Screening Level Data	1,300
8	A-0014	N/A	30128503426140000	501 Birch	CSOU Screening Level Data	932
9	A-0020	N/A	30128503408180000	719 Chestnut	CSOU Screening Level Data	920
10	A-0021	N/A	30128502313100000	414 Monroe	CSOU Screening Level Data	723
11	A-0022	N/A	30128502314140000	413 Monroe	CSOU Screening Level Data	1,190
12	A-0023	N/A	30128502314020000	1304 E. 5th Street	CSOU Screening Level Data	913
13	A-0030	N/A	30128502320140000	1215 E. 3rd Street	CSOU Screening Level Data	990
14	A-0031	N/A	30128502320150000	1213 E. 3rd Street	CSOU Screening Level Data	404
15	A-0032	N/A	30128502327020000	1202 E. 3rd Street	CSOU Screening Level Data	1,900
16	A-0036	N/A	30128502307070000	1212 E. 6th Street	CSOU Screening Level Data	648
17	A-0039	N/A	30128502306110000	1119 E. 5th Street	CSOU Screening Level Data	2,230
18	A-0042	N/A	30128502313190000	1203 E. 4th Street	CSOU Screening Level Data	641
19	A-0047	N/A	30128503425010000	516 E. 6th Street	CSOU Screening Level Data	3,890
20	A-0048	N/A	30128503408110000	513 E. 7th Street	CSOU Screening Level Data	2,690
21	A-0052	N/A	30128502314110000	4th and Monroe St.	CSOU Screening Level Data	975
22	A-0054	N/A	30128503425100000	500 Birch	CSOU Screening Level Data	13,100
23	A-0055	N/A	30128503425090000	506 Birch	CSOU Screening Level Data	1,010
24	A-0056	N/A	30128503406040000	714 Cedar	CSOU Screening Level Data	884
25	A-0058	N/A	30128502402010000	1421 E. Park	CSOU Screening Level Data	542
26	A-0060	N/A	30128502307090000	1220 E. 6th Street	CSOU Screening Level Data	668
27	A-0061	N/A	30128502307080000	1216 E. 6th Street	CSOU Screening Level Data	684
28	A-0062	N/A	30128502307060000	1210 E. 6th Street	CSOU Screening Level Data	861
29	A-0063	N/A	30128502307050000	1208 E. 6th Street	CSOU Screening Level Data	1,060
30	A-0064	N/A	30128502307010000	1200 E. 6th Street	CSOU Screening Level Data	1,180

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
31	A-0065	N/A	30128502307100000	1217 E. 5th Street	CSOU Screening Level Data	699
32	A-0066	N/A	30128502307110000	512 Monroe Street	CSOU Screening Level Data	667
33	A-0067	N/A	30128502307120000	1215 E. 5th Street	CSOU Screening Level Data	480
34	A-0068	N/A	30128502307130000	1215 E. 5th Street	CSOU Screening Level Data	1,120
35	A-0069	N/A	30128502307140000	1209 E. 5th Street	CSOU Screening Level Data	877
36	A-0070	N/A	30128502307150000	1207 E. 5th Street	CSOU Screening Level Data	894
37	A-0071	N/A	30128502307160000	1218 E. 5th Street	CSOU Screening Level Data	758
38	A-0072	N/A	30128502307170000	1203 E. 5th Street	CSOU Screening Level Data	4,010
39	A-0073	N/A	30128502307180000	1201 E. 5th Street	CSOU Screening Level Data	4,200
40	A-0074	N/A	30128502314050000	416 Jackson	CSOU Screening Level Data	500
41	A-0077	N/A	30128502314030000	1306 E. 5th Street	CSOU Screening Level Data	1,120
42	A-0078	N/A	30128502314010000	1300 E. 5th Street	CSOU Screening Level Data	746
43	A-0079	N/A	30128502314150000	415 Monroe	CSOU Screening Level Data	1,120
44	A-0080	N/A	30128502314120000	405-407 Monroe	CSOU Screening Level Data	611
45	A-0082	N/A	30128502313090000	1218 E. 5th Street	CSOU Screening Level Data	524
46	A-0083	N/A	30128502313080000	1216 E. 5th Street	CSOU Screening Level Data	1,390
47	A-0084	N/A	30128502313070000	1214 E. 5th Street	CSOU Screening Level Data	1,850
48	A-0085	N/A	30128502313060000	1208 E. 5th Street	CSOU Screening Level Data	606
49	A-0086	N/A	30128502313040000	1204 E. 5th Street	CSOU Screening Level Data	1,020
50	A-0087	N/A	30128502313030000	1202 E. 5th Street	CSOU Screening Level Data	1,620
51	A-0088	N/A	30128502313010000	413 Madison	CSOU Screening Level Data	688
52	A-0091	N/A	30128502313130000	1215 E. 4th Street	CSOU Screening Level Data	740
53	A-0092	N/A	30128502313140000	1213 E. 4th Street	CSOU Screening Level Data	940
54	A-0093	N/A	30128502313150000	1211 E. 4th Street	CSOU Screening Level Data	1,200
55	A-0094	N/A	30128502313160000	1209 E. 4th Street	CSOU Screening Level Data	559
56	A-0095	N/A	30128502313170000	1207 E. 4th Street	CSOU Screening Level Data	1,640
57	A-0096	N/A	30128502313180000	1205 E. 4th Street	CSOU Screening Level Data	1,570
58	A-0097	N/A	30128502313210000	411 Madison	CSOU Screening Level Data	561
59	A-0098	N/A	30128502313200000	1201 E. 4th Street	CSOU Screening Level Data	423
60	A-0099	N/A	30128502319100000	1216 E. 4th Street	CSOU Screening Level Data	1,950

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
61	A-0100	N/A	30128502319090000	1214 E. 4th Street	CSOU Screening Level Data	2,170
62	A-0101	N/A	30128502319080000	1212 E. 4th Street	CSOU Screening Level Data	1,990
63	A-0102	N/A	30128502319070000	1210 E. 4th Street	CSOU Screening Level Data	2,590
64	A-0103	N/A	30128502319060000	1208 E. 4th Street	CSOU Screening Level Data	1,780
65	A-0104	N/A	30128502319050000	1206.5 E. 4th Street	CSOU Screening Level Data	1,360
66	A-0105	N/A	30128502319040000	1206 E. 4th Street	CSOU Screening Level Data	806
67	A-0106	N/A	30128502319030000	1204 E. 4th Street	CSOU Screening Level Data	932
68	A-0107	N/A	30128502319010000	1200 E. 4th Street	CSOU Screening Level Data	449
69	A-0108	N/A	30128502320120000	1217 E. 3rd Street	CSOU Screening Level Data	1,080
70	A-0109	N/A	30128502327090000	220 Monroe	CSOU Screening Level Data	726
71	A-0110	N/A	30128502327100000	214 Monroe	CSOU Screening Level Data	666
72	A-0111	N/A	30128502327110000	212 Monroe	CSOU Screening Level Data	1,120
73	A-0112	N/A	30128502327120000	210 Monroe	CSOU Screening Level Data	857
74	A-0113	N/A	30128502327080000	1214 E. 3rd Street	CSOU Screening Level Data	1,180
75	A-0114	N/A	30128502327070000	1212 E. 3rd Street	CSOU Screening Level Data	2,910
76	A-0115	N/A	30128502327050000	1208 E. 3rd Street	CSOU Screening Level Data	619
77	A-0117	N/A	30128502327040000	1206 E. 3rd Street	CSOU Screening Level Data	1,090
78	A-0118	N/A	30128502327010000	209-211 Madison	CSOU Screening Level Data	659
79	A-0119	N/A	30128502327150000	1219 Park	CSOU Screening Level Data	1,180
80	A-0120	N/A	30128502327160000	1215 Park	CSOU Screening Level Data	644
81	A-0121	N/A	30128502327170000	1213 E. Park	CSOU Screening Level Data	804
82	A-0122	N/A	30128502327180000	1209 Park	CSOU Screening Level Data	492
83	A-0123	N/A	30128502327190000	1205 Park	CSOU Screening Level Data	630
84	A-0124	N/A	30128502306090000	1120 E. 6th Street	CSOU Screening Level Data	483
85	A-0125	N/A	30128502306080000	1114 E. 6th Street	CSOU Screening Level Data	667
86	A-0126	N/A	30128502306070000	1112 E. 6th Street	CSOU Screening Level Data	1,020
87	A-0127	N/A	30128502306060000	1110 E. 6th Street	CSOU Screening Level Data	660
88	A-0128	N/A	30128502306030000	1104 E. 6th Street	CSOU Screening Level Data	1,350
89	A-0129	N/A	30128502306020000	1102 E. 6th Street	CSOU Screening Level Data	3,780
90	A-0130	N/A	30128502306100000	1121 E. 5th	CSOU Screening Level Data	834

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
91	A-0131	N/A	30128502306120000	1113,1115 E. 5th Street	CSOU Screening Level Data	1,150
92	A-0133	N/A	30128502306140000	1109 E. 5th Street	CSOU Screening Level Data	980
93	A-0134	N/A	30128502306150000	1107 E. 5th Street	CSOU Screening Level Data	2,840
94	A-0135	N/A	30128502306160000	1105 E. 5th Street	CSOU Screening Level Data	927
95	A-0136	N/A	30128502306170000	1103 E. 5th Street	EPA 2007 Data	2,330
96	A-0137	N/A	30128502306180000	1101 E. 5th Street	CSOU Screening Level Data	748
97	A-0139	N/A	30128502312110000	410 Madison	CSOU Screening Level Data	619
98	A-0140	N/A	30128502312090000	1116 E. 5th Street	CSOU Screening Level Data	4,500
99	A-0141	N/A	30128502312080000	1114 E. 5th Street	CSOU Screening Level Data	699
100	A-0142	N/A	30128502312060000	1110 E. 5th Street	CSOU Screening Level Data	806
101	A-0143	N/A	30128502312050000	1108 E. 5th Street	CSOU Screening Level Data	1,290
102	A-0144	N/A	30128502312040000	1106 E. 5th Street	CSOU Screening Level Data	2,110
103	A-0145	N/A	30128502312030000	1104 E. 5th Street	CSOU Screening Level Data	1,040
104	A-0146	N/A	30128502312020000	1102 E. 5th Street	CSOU Screening Level Data	861
105	A-0147	N/A	30128502312010000	1100 E. 5th Street	CSOU Screening Level Data	828
106	A-0148	N/A	30128502312120000	408 Madison	CSOU Screening Level Data	560
107	A-0149	N/A	30128502312140000	1117 E. 4th Street	CSOU Screening Level Data	991
108	A-0150	N/A	30128502312150000	1115 E. 4th Street	CSOU Screening Level Data	807
109	A-0152	N/A	30128502312170000	1107 E. 4th Street	CSOU Screening Level Data	1,380
110	A-0153	N/A	30128502312180000	1105 E. 4th Street	CSOU Screening Level Data	718
111	A-0154	N/A	30128502312190000	401 Jefferson	CSOU Screening Level Data	1,060
112	A-0155	N/A	30128502311100000	1020 E. 5th Street	CSOU Screening Level Data	679
113	A-0156	N/A	30128502311110000	412 Jefferson	CSOU Screening Level Data	1,360
114	A-0157	N/A	30128502311090000	1018 E. 5th Street	CSOU Screening Level Data	1,870
115	A-0158	N/A	30128502311080000	1016 E. 5th Street	CSOU Screening Level Data	3,830
116	A-0159	N/A	30128502311070000	1012 E. 5th Street	CSOU Screening Level Data	475
117	A-0160	N/A	30128502311060000	1010 E. 5th Street	CSOU Screening Level Data	1,780
118	A-0161	N/A	30128502311050000	1008 E. 5th Street	CSOU Screening Level Data	769
119	A-0162	N/A	30128502311030000	1002 E. 5th Street	CSOU Screening Level Data	1,490
120	A-0163	N/A	30128502311020000	1000 E. 5th Street	CSOU Screening Level Data	3,290

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
121	A-0165	N/A	30128502311120000	1019 E. 4th Street	CSOU Screening Level Data	445
122	A-0166	N/A	30128502311130000	1017 E. 4th Street	CSOU Screening Level Data	532
123	A-0167	N/A	30128502311140000	1015 E. 4th Street	CSOU Screening Level Data	587
124	A-0168	N/A	30128502311150000	1013 E. 4th Street	CSOU Screening Level Data	907
125	A-0169	N/A	30128502311160000	1011 E. 4th Street	CSOU Screening Level Data	2,140
126	A-0170	N/A	30128502311170000	1009 E. 4th Street	CSOU Screening Level Data	683
127	A-0171	N/A	30128502311180000	1007 E. 4th Street	CSOU Screening Level Data	2,610
128	A-0172	N/A	30128502311190000	1003 E. 4th Street	CSOU Screening Level Data	1,250
129	A-0174	N/A	30128502311230000	405 Adams	CSOU Screening Level Data	936
130	A-0175	N/A	30128502311220000	403 Adams	CSOU Screening Level Data	595
131	A-0176	N/A	30128502311210000	401 Adams	CSOU Screening Level Data	2,150
132	A-0177	N/A	30128502318090000	1118 E. 4th Street	CSOU Screening Level Data	1,650
133	A-0179	N/A	30128502318070000	1114 E. 4th Street	CSOU Screening Level Data	1,590
134	A-0180	N/A	30128502318060000	1112 E. 4th Street	CSOU Screening Level Data	709
135	A-0181	N/A	30128502318050000	1110 E. 4th Street	CSOU Screening Level Data	843
136	A-0182	N/A	30128502318040000	1106 E. 4th Street	CSOU Screening Level Data	654
137	A-0183	N/A	30128502318030000	1104 E. 4th Street	CSOU Screening Level Data	1,160
138	A-0184	N/A	30128502318020000	1102 E. 4th Street	CSOU Screening Level Data	2,490
139	A-0185	N/A	30128502318010000	1100 E. 4th Street	CSOU Screening Level Data	1,550
140	A-0186	N/A	30128502318100000	310 Madison	CSOU Screening Level Data	1,090
141	A-0187	N/A	30128502318110000	1119 E. 3rd Street	CSOU Screening Level Data	828
142	A-0188	N/A	30128502318120000	1117 E. 3rd Street	CSOU Screening Level Data	1,620
143	A-0189	N/A	30128502318140000	1111 E. 3rd Street	CSOU Screening Level Data	1,360
144	A-0190	N/A	30128502318150000	1109 E. 3rd Street	CSOU Screening Level Data	542
145	A-0192	N/A	30128502318170000	1105 E. 3rd Street	CSOU Screening Level Data	760
146	A-0193	N/A	30128502318180000	1103 E. 3rd Street	CSOU Screening Level Data	974
147	A-0194	N/A	30128502318190000	1101 E. 3rd Street	CSOU Screening Level Data	1,920
148	A-0195	N/A	30128502317100000	1020 E. 4th Street	CSOU Screening Level Data	932
149	A-0197	N/A	30128502317080000	1016 E. 4th Street	CSOU Screening Level Data	985
150	A-0198	N/A	30128502317070000	1014 E. 4th Street	CSOU Screening Level Data	1,400

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
151	A-0199	N/A	30128502317060000	1012 E. 4th Street	CSOU Screening Level Data	1,320
152	A-0200	N/A	30128502317050000	1010 E. 4th Street	CSOU Screening Level Data	1,670
153	A-0201	N/A	30128502317040000	1006 E. 4th Street	CSOU Screening Level Data	994
154	A-0202	N/A	30128502317030000	1004 E. 4th Street	CSOU Screening Level Data	648
155	A-0203	N/A	30128502317020000	1002 E. 4th Street	CSOU Screening Level Data	1,680
156	A-0204	N/A	30128502317010000	1000 E. 4th Street	CSOU Screening Level Data	1,250
157	A-0205	N/A	30128502317110000	1019 E. 3rd Street	CSOU Screening Level Data	994
158	A-0206	N/A	30128502317120000	1017 E. 3rd Street	CSOU Screening Level Data	1,220
159	A-0207	N/A	30128502317130000	1015 E. 3rd Street	CSOU Screening Level Data	5,110
160	A-0208	N/A	30128502317140000	1013 E. 3rd Street	CSOU Screening Level Data	807
161	A-0209	N/A	30128502317150000	1011 E. 3rd Street	CSOU Screening Level Data	2,240
162	A-0210	N/A	30128502317160000	1009 E. 3rd	CSOU Screening Level Data	934
163	A-0211	N/A	30128502317180000	1005 E. 3rd Street	CSOU Screening Level Data	420
164	A-0214	N/A	30128502317200000	307 Adams	CSOU Screening Level Data	1,600
165	A-0215	N/A	30128502324110000	1016 E. 3rd Street	CSOU Screening Level Data	2,520
166	A-0217	N/A	30128502324120000	1012 E. 3rd Street	CSOU Screening Level Data	767
167	A-0218	N/A	30128502324130000	1010 E. 3rd Street	CSOU Screening Level Data	881
168	A-0219	N/A	30128502324140000	1008 E. 3rd Street	CSOU Screening Level Data	460
169	A-0220	N/A	30128502324150000	1006 E. 3rd Street	CSOU Screening Level Data	499
170	A-0221	N/A	30128502324160000	1004 E. 3rd Street	CSOU Screening Level Data	683
171	A-0223	N/A	30128502324170000	211 Adams	CSOU Screening Level Data	492
172	A-0224	N/A	30128502324080000	1015 E. Park	CSOU Screening Level Data	454
173	A-0226	N/A	30128502324060000	1007 E. Park	CSOU Screening Level Data	590
174	A-0227	N/A	30128502324050000	1007 E. Park	CSOU Screening Level Data	998
175	A-0228	N/A	30128502324040000	1005 E. Park	CSOU Screening Level Data	518
176	A-0229	N/A	30128502324030000	1003 E. Park	CSOU Screening Level Data	1,260
177	A-0230	N/A	30128502324020000	209 Adams	CSOU Screening Level Data	2,510
178	A-0231	N/A	30128502324010000	1001 E. Park	CSOU Screening Level Data	2,330
179	A-0232	N/A	30128502333080000	1114 Park	CSOU Screening Level Data	560
180	A-0233	N/A	30128502333070000	1112 E. Park	CSOU Screening Level Data	1,220

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
181	A-0234	N/A	30128502333060000	1110 Park	CSOU Screening Level Data	2,140
182	A-0235	N/A	30128502333050000	1108 Park	CSOU Screening Level Data	861
183	A-0236	N/A	30128502333040000	1106 Park	CSOU Screening Level Data	650
184	A-0237	N/A	30128502333030000	1104 Park	CSOU Screening Level Data	1,610
185	A-0238	N/A	30128502333020000	1102 Park	CSOU Screening Level Data	1,280
186	A-0239	N/A	30128502333010000	1100 Park	CSOU Screening Level Data	580
187	A-0240	N/A	30128502332080000	1024 E. Park	CSOU Screening Level Data	1,510
188	A-0245	N/A	30128502332030000	1012 E. Park	CSOU Screening Level Data	622
189	A-0247	N/A	30128502333120000	1115 E. Commercial	CSOU Screening Level Data	899
190	A-0248	N/A	30128502333130000	1113 E. Commercial	CSOU Screening Level Data	1,560
191	A-0249	N/A	30128502333140000	1111 E. Commercial	CSOU Screening Level Data	1,180
192	A-0251	N/A	30128502333160000	1107 E. Commercial	CSOU Screening Level Data	1,070
193	A-0252	N/A	30128502333180000	1103 E. Commercial	CSOU Screening Level Data	1,930
194	A-0253	N/A	30128502333210000	107 Jefferson	CSOU Screening Level Data	1,580
195	A-0254	N/A	30128502333200000	105 Jefferson	CSOU Screening Level Data	493
196	A-0255	N/A	30128502333190000	1101 E. Commercial	CSOU Screening Level Data	655
197	A-0256	N/A	30128502332100000	1023 Commercial	CSOU Screening Level Data	421
198	A-0257	N/A	30128502332110000	1021 Commercial	CSOU Screening Level Data	562
199	A-0258	N/A	30128502332130000	1019 1/2 Commercial	CSOU Screening Level Data	3,400
200	A-0262	N/A	30128502332160000	1013 Commercial	CSOU Screening Level Data	1,080
201	A-0263	N/A	30128502332170000	1011 Commercial Street	CSOU Screening Level Data	462
202	A-0265	N/A	30128504407050000	1002 W. 4th Street	CSOU Screening Level Data	978
203	A-0266	N/A	30128503309070000	606 Pine	CSOU Screening Level Data	641
204	A-0267	N/A	30128503206150000	409 W. 3rd Street	CSOU Screening Level Data	1,360
205	A-0268	N/A	30128503327060000	406 Locust	CSOU Screening Level Data	1,170
206	A-0269	N/A	30128503222130000	Street	EPA 2007 Data	1,330
207	A-0280	N/A	30128503103100000	214 E. 3rd Street	CSOU Screening Level Data	561
208	A-0282	N/A	30128503103080000	218 E. 3rd Street	CSOU Screening Level Data	1,520
209	A-0284	N/A	30128503436060000	121 E. 3rd Street	CSOU Screening Level Data	518
210	A-0285	N/A	30128503436050000	312 Oak	CSOU Screening Level Data	712

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
211	A-0288	N/A	30128503436020000	112 E. 4th Street	CSOU Screening Level Data	748
212	A-0291	N/A	30128503437020000	204 E. 4th Street	CSOU Screening Level Data	548
213	A-0292	N/A	30128503437030000	208 E. 4th Street	CSOU Screening Level Data	4,940
214	A-0293	N/A	30128503437040000	212 E. 4th Street	CSOU Screening Level Data	673
215	A-0294	N/A	30128503437050000	216 E. 4th Street	CSOU Screening Level Data	482
216	A-0295	N/A	30128503437060000	220 E. 4th Street	CSOU Screening Level Data	2,610
217	A-0296	N/A	30128503428030000	415 Main	CSOU Screening Level Data	623
218	A-0297	N/A	30128503428040000	417 Main	CSOU Screening Level Data	1,310
219	A-0298	N/A	30128503428050000	419 Main	CSOU Screening Level Data	682
220	A-0301	N/A	30128503429110000	209 E. 4th Street	CSOU Screening Level Data	1,070
221	A-0302	N/A	30128503429130000	405 Oak	CSOU Screening Level Data	1,210
222	A-0303	N/A	30128503429140000	409 Oak	CSOU Screening Level Data	671
223	A-0306	N/A	30128503429170000	419 Oak	CSOU Screening Level Data	1,560
224	A-0308	N/A	30128503429190000	210 E. 5th Street	CSOU Screening Level Data	662
225	A-0309	N/A	30128503429100000	213 E. 4th Street	CSOU Screening Level Data	421
226	A-0310	N/A	30128503429090000	400 Cherry	CSOU Screening Level Data	1,470
227	A-0311	N/A	30128503429080000	404 Cherry	CSOU Screening Level Data	1,030
228	A-0313	N/A	30128503429060000	408 Cherry	CSOU Screening Level Data	2,020
229	A-0314	N/A	30128503429050000	410 Cherry	CSOU Screening Level Data	1,070
230	A-0316	N/A	30128503429030000	414 Cherry	CSOU Screening Level Data	894
231	A-0317	N/A	30128503429010000	212 E. 5th Street	CSOU Screening Level Data	551
232	A-0318	N/A	30128503429020000	420 Cherry	CSOU Screening Level Data	1,930
233	A-0320	N/A	30128503421070000	115 E. 5th Street	CSOU Screening Level Data	594
234	A-0321	N/A	30128503432040000	416 Birch	CSOU Screening Level Data	624
235	A-0322	N/A	30128503432030000	418 Birch	CSOU Screening Level Data	909
236	A-0323	N/A	30128503432220000	512 E. 5th Street	CSOU Screening Level Data	992
237	A-0324	N/A	30128503432010000	518 E. 5th Street	CSOU Screening Level Data	2,190
238	A-0325	N/A	30128503432020000	424 Birch	CSOU Screening Level Data	1,100
239	A-0326	N/A	30128503432050000	414 Birch	CSOU Screening Level Data	644
240	A-0327	N/A	30128503408160000	715 Chestnut	CSOU Screening Level Data	1,040

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
241	A-0329	N/A	30128503425070000	514 Birch	CSOU Screening Level Data	2,180
242	A-0330	N/A	30128503425060000	516 Birch	CSOU Screening Level Data	1,750
243	A-0331	N/A	30128503425050000	518 Birch	CSOU Screening Level Data	2,570
244	A-0332	N/A	30128503425040000	520 Birch	CSOU Screening Level Data	719
245	A-0333	N/A	30128503425020000	518 E. 6th Street	CSOU Screening Level Data	5,520
246	A-0334	N/A	30128503425030000	522 Birch	CSOU Screening Level Data	872
247	A-0335	N/A	30128503418070000	606 Birch	CSOU Screening Level Data	2,240
248	A-0336	N/A	30128503418060000	610 Birch	CSOU Screening Level Data	1,340
249	A-0337	N/A	30128503418040000	618 Birch	CSOU Screening Level Data	1,130
250	A-0338	N/A	30128503418010000	514 E. 7th Street	CSOU Screening Level Data	722
251	A-0340	N/A	30128503408150000	713 Chestnut	CSOU Screening Level Data	1,540
252	A-0341	N/A	30128510101020000	503 E. 8th Street	CSOU Screening Level Data	765
253	A-0342	N/A	30128503408070000	706 Birch	CSOU Screening Level Data	2,970
254	A-0343	N/A	30128503408060000	710 Birch	CSOU Screening Level Data	976
255	A-0347	N/A	30128503433130000	609 E. 4th Street	CSOU Screening Level Data	1,860
256	A-0348	N/A	30128503433150000	405 Birch	CSOU Screening Level Data	1,540
257	A-0349	N/A	30128503433160000	409 Birch	CSOU Screening Level Data	739
258	A-0350	N/A	30128503433170000	413 Birch	CSOU Screening Level Data	2,750
259	A-0351	N/A	30128503433180000	415 Birch	CSOU Screening Level Data	1,660
260	A-0352	N/A	30128503433190000	417 Birch	CSOU Screening Level Data	846
261	A-0353	N/A	30128503433200000	419 Birch Street	CSOU Screening Level Data	648
262	A-0354	N/A	30128503433220000	423 Birch	CSOU Screening Level Data	637
263	A-0355	N/A	30128503433230000	606 E. 5th Street	CSOU Screening Level Data	4,840
264	A-0356	N/A	30128503433240000	610 E. 5th Street	CSOU Screening Level Data	971
265	A-0357	N/A	30128503426120000	611 E. 5th Street	CSOU Screening Level Data	766
266	A-0358	N/A	30128503426130000	605 E. 5th Street	CSOU Screening Level Data	790
267	A-0359	N/A	30128503426150000	503 Birch	CSOU Screening Level Data	987
268	A-0360	N/A	30128503426160000	505 Birch	CSOU Screening Level Data	1,370
269	A-0361	N/A	30128503426180000	509 Birch	CSOU Screening Level Data	473
270	A-0362	N/A	30128503426190000	511 Birch	CSOU Screening Level Data	972

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
271	A-0363	N/A	30128503426200000	517 Birch	CSOU Screening Level Data	425
272	A-0364	N/A	30128503426220000	521 Birch	CSOU Screening Level Data	962
273	A-0365	N/A	30128503426230000	523 Birch	CSOU Screening Level Data	2,460
274	A-0366	N/A	30128503426240000	606 E. 6th Street	CSOU Screening Level Data	855
275	A-0368	N/A	30128503419130000	601 E. 6th Street	CSOU Screening Level Data	1,020
276	A-0369	N/A	30128503419120000	605 E. 6th Street	CSOU Screening Level Data	616
277	A-0370	N/A	30128503419110000	607 E. 6th Street	CSOU Screening Level Data	817
278	A-0371	N/A	30128503419140000	611 Birch	CSOU Screening Level Data	883
279	A-0372	N/A	30128503419160000	615 Birch	CSOU Screening Level Data	404
280	A-0373	N/A	30128503419170000	615 1/2 Birch	CSOU Screening Level Data	758
281	A-0374	N/A	30128503419180000	617 Birch	CSOU Screening Level Data	680
282	A-0375	N/A	30128503419200000	612 E. 7th Street	CSOU Screening Level Data	1,750
283	A-0376	N/A	30128503409120000	609 E. 7th Street	CSOU Screening Level Data	2,910
284	A-0377	N/A	30128503409140000	703 Birch	CSOU Screening Level Data	1,860
285	A-0380	N/A	30128503409170000	715 Birch	CSOU Screening Level Data	594
286	A-0381	N/A	30128503409190000	717 Birch	CSOU Screening Level Data	1,630
287	A-0382	N/A	30128503409200000	721 Birch	CSOU Screening Level Data	1,250
288	A-0383	N/A	30128510102280000	801 Birch	CSOU Screening Level Data	589
289	A-0384	N/A	30128510102380000	809 Birch	CSOU Screening Level Data	609
290	A-0385	N/A	30128510102400000	813 Birch	CSOU Screening Level Data	1,360
291	A-0387	N/A	30128503433120000	615 E. 4th Street	CSOU Screening Level Data	1,190
292	A-0388	N/A	30128503433110000	617 E. 4th Street	CSOU Screening Level Data	602
293	A-0389	N/A	30128503433100000	404 Alder	CSOU Screening Level Data	852
294	A-0390	N/A	30128503433090000	410 Alder	CSOU Screening Level Data	570
295	A-0391	N/A	30128503433080000	412 Alder	CSOU Screening Level Data	438
296	A-0392	N/A	30128503433070000	414 Alder	CSOU Screening Level Data	2,990
297	A-0393	N/A	30128503433050000	418 Alder	CSOU Screening Level Data	2,590
298	A-0394	N/A	30128503433010000	612 E. 5th Street	CSOU Screening Level Data	3,090
299	A-0395	N/A	30128503433020000	614 E. 5th Street	CSOU Screening Level Data	1,960
300	A-0396	N/A	30128503433040000	420 Alder	CSOU Screening Level Data	1,200

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
301	A-0397	N/A	30128503433030000	422 Alder	CSOU Screening Level Data	1,550
302	A-0398	N/A	30128503426100000	500 Alder	CSOU Screening Level Data	826
303	A-0399	N/A	30128503426090000	502 Alder	CSOU Screening Level Data	864
304	A-0400	N/A	30128503426110000	617 E. 5th Street	CSOU Screening Level Data	915
305	A-0402	N/A	30128503426080000	506 Alder	CSOU Screening Level Data	907
306	A-0403	N/A	30128503426040000	516 Alder	CSOU Screening Level Data	912
307	A-0404	N/A	30128503426010000	612 E. 6th Street	CSOU Screening Level Data	1,010
308	A-0406	N/A	30128503426030000	518 Alder	CSOU Screening Level Data	733
309	A-0407	N/A	30128503419090000	600 Alder	CSOU Screening Level Data	1,560
310	A-0408	N/A	30128503419070000	610 Alder	CSOU Screening Level Data	924
311	A-0409	N/A	30128503419050000	616 Alder	CSOU Screening Level Data	885
312	A-0410	N/A	30128503419040000	618 Alder	CSOU Screening Level Data	1,260
313	A-0411	N/A	30128503419010000	614 E. 7th Street	CSOU Screening Level Data	627
314	A-0412	N/A	30128503419020000	616 E. 7th Street	CSOU Screening Level Data	516
315	A-0413	N/A	30128503409110000	613 E. 7th Street	CSOU Screening Level Data	2,130
316	A-0414	N/A	30128503409100000	700 Alder	CSOU Screening Level Data	533
317	A-0415	N/A	30128503409080000	706 Alder	CSOU Screening Level Data	1,400
318	A-0418	N/A	30128503409050000	712 Alder	CSOU Screening Level Data	751
319	A-0419	N/A	30128503409030000	720 Alder	CSOU Screening Level Data	1,050
320	A-0420	N/A	30128503409020000	722 Alder	CSOU Screening Level Data	963
321	A-0421	N/A	30128503409010000	724 Alder	CSOU Screening Level Data	1,250
322	A-0422	N/A	30128510102250000	611 E. 8th Street	CSOU Screening Level Data	460
323	A-0423	N/A	30128510102240000	613 E. 8th Street	CSOU Screening Level Data	1,700
324	A-0424	N/A	30128510102230000	615 E. 8th Street	CSOU Screening Level Data	1,010
325	A-0425	N/A	30128510102220000	617 E. 8th Street	CSOU Screening Level Data	930
326	A-0426	N/A	30128510102210000	619 E. 8th Street	CSOU Screening Level Data	1,250
327	A-0427	N/A	30128503435150000	411 Alder	CSOU Screening Level Data	1,710
328	A-0428	N/A	30128503435160000	413 Alder	CSOU Screening Level Data	869
329	A-0429	N/A	30128503435170000	415 Alder	CSOU Screening Level Data	896
330	A-0431	N/A	30128503435190000	419 Alder	CSOU Screening Level Data	1,450

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
331	A-0433	N/A	30128503435210000	423 Alder	CSOU Screening Level Data	470
332	A-0434	N/A	30128503435220000	712 E. 5th Street	CSOU Screening Level Data	681
333	A-0435	N/A	30128503435120000	Street	CSOU Screening Level Data	911
334	A-0436	N/A	30128503435100000	406 Ash	EPA 2007 Data	1,990
335	A-0437	N/A	30128503435090000	408 Ash	CSOU Screening Level Data	744
336	A-0438	N/A	30128503435080000	410 Ash	CSOU Screening Level Data	733
337	A-0439	N/A	30128503435070000	414 Ash Street	CSOU Screening Level Data	444
338	A-0440	N/A	30128503435060000	416 Ash	CSOU Screening Level Data	924
339	A-0441	N/A	30128503435050000	418 Ash St.	CSOU Screening Level Data	1,080
340	A-0442	N/A	30128503435010000	716 E. 5th Street	CSOU Screening Level Data	696
341	A-0443	N/A	30128503435020000	718 E. 5th Street	CSOU Screening Level Data	1,370
342	A-0444	N/A	30128503435030000	720 E. 5th Street	CSOU Screening Level Data	1,080
343	A-0445	N/A	30128503435040000	722 E. 5th Street	CSOU Screening Level Data	1,760
344	A-0446	N/A	30128503427160000	501 Alder	CSOU Screening Level Data	3,010
345	A-0447	N/A	30128503427150000	711 E. 5th Street	CSOU Screening Level Data	1,080
346	A-0448	N/A	30128503427170000	505 Alder	CSOU Screening Level Data	1,050
347	A-0449	N/A	30128503427180000	507 Alder	CSOU Screening Level Data	615
348	A-0450	N/A	30128503427190000	509 Alder	CSOU Screening Level Data	499
349	A-0451	N/A	30128503427200000	511 Alder	CSOU Screening Level Data	1,010
350	A-0453	N/A	30128503427230000	517 Alder	CSOU Screening Level Data	821
351	A-0454	N/A	30128503427240000	519 Alder	CSOU Screening Level Data	1,060
352	A-0455	N/A	30128503427250000	521 Alder	CSOU Screening Level Data	1,560
353	A-0456	N/A	30128503427260000	702 E. 6th Street	CSOU Screening Level Data	4,300
354	A-0457	N/A	30128503427270000	704 E. 6th Street	CSOU Screening Level Data	1,710
355	A-0458	N/A	30128503420130000	601 Alder	CSOU Screening Level Data	606
356	A-0460	N/A	30128503420140000	607 Alder	CSOU Screening Level Data	1,060
357	A-0461	N/A	30128503420150000	609 Alder	CSOU Screening Level Data	713
358	A-0462	N/A	30128503420160000	611 Alder	CSOU Screening Level Data	755
359	A-0463	N/A	30128503420170000	613 Alder	CSOU Screening Level Data	1,260
360	A-0464	N/A	30128503420180000	615 Alder	CSOU Screening Level Data	1,440

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
361	A-0465	N/A	30128503420190000	617 Alder	CSOU Screening Level Data	845
362	A-0466	N/A	30128503420200000	619 Alder	CSOU Screening Level Data	787
363	A-0468	N/A	30128503427140000	713 E. 5th Street	CSOU Screening Level Data	709
364	A-0469	N/A	30128503427130000	715 E. 5th Street	CSOU Screening Level Data	926
365	A-0470	N/A	30128503427120000	721 E. 5th Street	CSOU Screening Level Data	688
366	A-0471	N/A	30128503427110000	504 Ash	CSOU Screening Level Data	1,300
367	A-0472	N/A	30128503427100000	506 Ash	CSOU Screening Level Data	812
368	A-0473	N/A	30128503427090000	508 Ash	CSOU Screening Level Data	923
369	A-0474	N/A	30128503427070000	512 Ash	CSOU Screening Level Data	1,390
370	A-0476	N/A	30128503427050000	516 Ash	CSOU Screening Level Data	1,220
371	A-0477	N/A	30128503427040000	518 Ash	CSOU Screening Level Data	1,030
372	A-0478	N/A	30128503427010000	706 E. 6th Street	CSOU Screening Level Data	1,440
373	A-0479	N/A	30128503427020000	708 E. 6th Street	CSOU Screening Level Data	685
374	A-0480	N/A	30128503427030000	522 Ash	CSOU Screening Level Data	1,120
375	A-0481	N/A	30128503420110000	713 E. 6th Street	CSOU Screening Level Data	1,030
376	A-0482	N/A	30128503420100000	602 Ash	CSOU Screening Level Data	2,890
377	A-0484	N/A	30128503420080000	606 Ash	CSOU Screening Level Data	410
378	A-0485	N/A	30128503420060000	612 Ash Street	CSOU Screening Level Data	1,520
379	A-0486	N/A	30128503420050000	614 Ash	CSOU Screening Level Data	720
380	A-0487	N/A	30128503420010000	714 E. 7th Street	CSOU Screening Level Data	713
381	A-0488	N/A	30128503420020000	620 Ash	CSOU Screening Level Data	849
382	A-0489	N/A	30128503410090000	701 Alder	CSOU Screening Level Data	688
383	A-0491	N/A	30128503410110000	709 Alder St.	CSOU Screening Level Data	1,210
384	A-0495	N/A	30128503410070000	715 E. 7th Street	CSOU Screening Level Data	780
385	A-0496	N/A	30128503410060000	717 E. 7th Street	CSOU Screening Level Data	931
386	A-0497	N/A	30128503410050000	719 E. 7th Street	CSOU Screening Level Data	936
387	A-0498	N/A	30128503410040000	721 E. 7th Street	CSOU Screening Level Data	1,700
388	A-0499	N/A	30128503410030000	714 Ash	CSOU Screening Level Data	889
389	A-0500	N/A	30128503410020000	716 Ash	CSOU Screening Level Data	1,270
390	A-0501	N/A	30128503410010000	718 Ash	CSOU Screening Level Data	408

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
391	A-0502	N/A	30128502301110000	619 Ash	CSOU Screening Level Data	1,980
392	A-0520	N/A	30128502335140000	1 Alder	CSOU Screening Level Data	699
393	A-0522	N/A	30128502335120000	9 Alder	CSOU Screening Level Data	1,350
394	A-0523	N/A	30128502335150000	707 Front	CSOU Screening Level Data	1,830
395	A-0525	N/A	30128502335170000	711 E. Front	CSOU Screening Level Data	1,300
396	A-0526	N/A	30128502335190000	715 E. Front	CSOU Screening Level Data	620
397	A-0528	N/A	30128502335110000	700 E. Commercial	CSOU Screening Level Data	1,600
398	A-0529	N/A	30128502335100000	702 E. Commercial	CSOU Screening Level Data	1,690
399	A-0530	N/A	30128502335090000	704 E. Commercial	CSOU Screening Level Data	3,420
400	A-0531	N/A	30128502335080000	706 E. Commercial	CSOU Screening Level Data	2,170
401	A-0532	N/A	30128502335070000	708 E. Commercial	CSOU Screening Level Data	2,480
402	A-0533	N/A	30128502335060000	710 E. Commercial	CSOU Screening Level Data	1,130
403	A-0534	N/A	30128502335050000	714 E. Commercial	CSOU Screening Level Data	1,190
404	A-0535	N/A	30128502335020000	720 E. Commercial	CSOU Screening Level Data	799
405	A-0536	N/A	30128502335010000	722 E. Commercial	CSOU Screening Level Data	1,910
406	A-0537	N/A	30128502328210000	107 Alder	CSOU Screening Level Data	1,480
407	A-0538	N/A	30128502328190000	707 E. Commercial	CSOU Screening Level Data	1,070
408	A-0539	N/A	30128502328180000	709 E. Commercial	CSOU Screening Level Data	400
409	A-0540	N/A	30128502328170000	713 E. Commercial	CSOU Screening Level Data	677
410	A-0543	N/A	30128502328140000	719 E. Commercial	CSOU Screening Level Data	561
411	A-0544	N/A	30128502328040000	113 Alder	CSOU Screening Level Data	657
412	A-0545	N/A	30128502328030000	117 Alder	CSOU Screening Level Data	1,720
413	A-0547	N/A	30128502328050000	706 E. Park	CSOU Screening Level Data	539
414	A-0548	N/A	30128502328060000	708 E. Park	CSOU Screening Level Data	1,470
415	A-0550	N/A	30128502328080000	714 E. Park	CSOU Screening Level Data	593
416	A-0551	N/A	30128502328090000	716 E. Park	CSOU Screening Level Data	917
417	A-0552	N/A	30128502328100000	718 E. Park	CSOU Screening Level Data	836
418	A-0553	N/A	30128502328110000	718 1/2 E. Park	CSOU Screening Level Data	2,110
419	A-0555	N/A	30128502336010000	808 E. Commercial	CSOU Screening Level Data	1,010
420	A-0557	N/A	30128502329100000	815 E. Commercial	CSOU Screening Level Data	802

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
421	A-0559	N/A	30128502329080000	823 E. Commercial	CSOU Screening Level Data	1,150
422	A-0562	N/A	30128502331020000	921 E. Commercial	CSOU Screening Level Data	767
423	A-0563	N/A	30128502329030000	812 E. Park	CSOU Screening Level Data	1,980
424	A-0564	N/A	30128502329040000	814 E. Park	CSOU Screening Level Data	841
425	A-0565	N/A	30128502329050000	816 E. Park	CSOU Screening Level Data	1,170
426	A-0566	N/A	30128502329070000	112 Washington	CSOU Screening Level Data	1,170
427	A-0567	N/A	30128502330020000	902 Park Street	CSOU Screening Level Data	544
428	A-0569	N/A	30128502330080000	914 E. Park	CSOU Screening Level Data	870
429	A-0570	N/A	30128502330090000	918 E. Park	CSOU Screening Level Data	990
430	A-0571	N/A	30128502330100000	920 E. Park	CSOU Screening Level Data	1,550
431	A-0572	N/A	30128502330110000	920 1/2 E. Park	CSOU Screening Level Data	1,420
432	A-0573	N/A	30128502322190000	807 E. Park	CSOU Screening Level Data	648
433	A-0574	N/A	30128502322180000	809, 811 E. Park	CSOU Screening Level Data	1,090
434	A-0575	N/A	30128502322170000	813 E. Park	CSOU Screening Level Data	1,040
435	A-0576	N/A	30128502322160000	815 E. Park	CSOU Screening Level Data	1,920
436	A-0577	N/A	30128502322140000	821 E. Park	CSOU Screening Level Data	834
437	A-0579	N/A	30128502322030000	804 E. 3rd Street	CSOU Screening Level Data	961
438	A-0580	N/A	30128502322040000	806 E. 3rd Street	CSOU Screening Level Data	1,970
439	A-0581	N/A	30128502322050000	808 E. 3rd Street	CSOU Screening Level Data	657
440	A-0582	N/A	30128502322060000	812 E. 3rd	CSOU Screening Level Data	2,640
441	A-0583	N/A	30128502322070000	814 E. 3rd Street	CSOU Screening Level Data	1,130
442	A-0584	N/A	30128502322090000	818 E. 3rd Street	CSOU Screening Level Data	2,600
443	A-0586	N/A	30128502322100000	214 Washington	CSOU Screening Level Data	3,910
444	A-0587	N/A	30128502323010000	215-217 Washington	CSOU Screening Level Data	2,570
445	A-0588	N/A	30128502323030000	902 E. 3rd Street	CSOU Screening Level Data	601
446	A-0589	N/A	30128502323190000	211 Washington	CSOU Screening Level Data	9,200
447	A-0590	N/A	30128502323180000	905 E. Park	CSOU Screening Level Data	692
448	A-0591	N/A	30128502323170000	909 E. Park	CSOU Screening Level Data	802
449	A-0593	N/A	30128502323150000	913 E. Park	CSOU Screening Level Data	656
450	A-0594	N/A	30128502323140000	917 Park	CSOU Screening Level Data	1,220

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
451	A-0595	N/A	30128502323130000	919 E. Park	CSOU Screening Level Data	932
452	A-0596	N/A	30128502323050000	906 E. 3rd Street	CSOU Screening Level Data	2,790
453	A-0597	N/A	30128502323060000	910 E. 3rd Street	CSOU Screening Level Data	2,490
454	A-0598	N/A	30128502323080000	912 E. 3rd Street	CSOU Screening Level Data	905
455	A-0599	N/A	30128502323110000	920 E. 3rd Street	CSOU Screening Level Data	512
456	A-0600	N/A	30128502332210000	1003 Commercial	CSOU Screening Level Data	465
457	A-0601	N/A	30128502332200000	1005 Commercial	CSOU Screening Level Data	1,640
458	A-0603	N/A	30128502332180000	1009 Commercial	CSOU Screening Level Data	599
459	A-0604	N/A	30128503407060000	708 Chestnut St	CSOU Screening Level Data	1,140
460	A-0605	N/A	30128503432170000	415 Chestnut	CSOU Screening Level Data	3,350
461	A-0607	N/A	30128503417020000	622 Chestnut	CSOU Screening Level Data	648
462	A-0608	N/A	30128503408170000	717 Chestnut	CSOU Screening Level Data	1,420
463	A-0609	N/A	30128503425220000	523 Chestnut	CSOU Screening Level Data	817
464	A-0610	N/A	30128503417130000	609 Cedar	CSOU Screening Level Data	1,160
465	A-0611	N/A	30128503418170000	621 Chestnut	CSOU Screening Level Data	716
466	A-0612	N/A	30128503418160000	619 Chestnut	CSOU Screening Level Data	2,870
467	A-0613	N/A	30128503418140000	613 Chestnut	CSOU Screening Level Data	646
468	A-0615	N/A	30128503418130000	611 Chestnut	CSOU Screening Level Data	916
469	A-0616	N/A	30128503418120000	609 Chestnut St	CSOU Screening Level Data	1,020
470	A-0618	N/A	30128503418090000	601 Chestnut	CSOU Screening Level Data	793
471	A-0619	N/A	30128503425230000	508 E. 6th Street	CSOU Screening Level Data	742
472	A-0620	N/A	30128503425210000	519 Chestnut	CSOU Screening Level Data	1,050
473	A-0621	N/A	30128503425200000	517 Chestnut	CSOU Screening Level Data	779
474	A-0624	N/A	30128503425160000	509 Chestnut	CSOU Screening Level Data	550
475	A-0626	N/A	30128503425140000	505 Chestnut	CSOU Screening Level Data	1,090
476	A-0627	N/A	30128503425120000	509 E. 5th Street	CSOU Screening Level Data	551
477	A-0628	N/A	30128503425130000	501 Chestnut	CSOU Screening Level Data	1,290
478	A-0629	N/A	30128503432210000	510 E. 5th Street	CSOU Screening Level Data	3,540
479	A-0630	N/A	30128503432200000	427 Chestnut	CSOU Screening Level Data	14,700
480	A-0631	N/A	30128503432190000	425 Chestnut	CSOU Screening Level Data	1,130

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
481	A-0632	N/A	30128503432180000	421 Chestnut	CSOU Screening Level Data	866
482	A-0633	N/A	30128503432160000	411 Chestnut	CSOU Screening Level Data	1,160
483	A-0636	N/A	30128503440070000	520 E. 4th Street	CSOU Screening Level Data	569
484	A-0638	N/A	30128503403040000	411 E. 8th Street	CSOU Screening Level Data	586
485	A-0641	N/A	30128503407020000	720 Chestnut	CSOU Screening Level Data	840
486	A-0642	N/A	30128503407010000	414 E. 8th Street	CSOU Screening Level Data	850
487	A-0643	N/A	30128503407030000	716 Chestnut	CSOU Screening Level Data	1,140
488	A-0644	N/A	30128503407040000	714 Chestnut	CSOU Screening Level Data	814
489	A-0645	N/A	30128503407050000	712 Chestnut	CSOU Screening Level Data	891
490	A-0646	N/A	30128503407070000	706 Chestnut	CSOU Screening Level Data	1,040
491	A-0647	N/A	30128503407080000	700 Chestnut	CSOU Screening Level Data	1,990
492	A-0648	N/A	30128503407190000	410 E. 8th Street	CSOU Screening Level Data	1,090
493	A-0649	N/A	30128503407180000	721 Cedar	CSOU Screening Level Data	2,930
494	A-0650	N/A	30128503407170000	717 Cedar	CSOU Screening Level Data	626
495	A-0651	N/A	30128503407160000	715 Cedar	CSOU Screening Level Data	761
496	A-0653	N/A	30128503407140000	711 Cedar	CSOU Screening Level Data	802
497	A-0655	N/A	30128503407120000	707 Cedar	CSOU Screening Level Data	1,630
498	A-0656	N/A	30128503407110000	705 Cedar	CSOU Screening Level Data	1,630
499	A-0657	N/A	30128503407090000	405 E. 7th Street	CSOU Screening Level Data	1,630
500	A-0658	N/A	30128503407100000	701 Cedar	CSOU Screening Level Data	1,460
501	A-0659	N/A	30128503417010000	416 E. 7th Street	CSOU Screening Level Data	1,200
502	A-0660	N/A	30128503417030000	620 Chestnut	CSOU Screening Level Data	1,520
503	A-0661	N/A	30128503417050000	616 Chestnut	CSOU Screening Level Data	1,420
504	A-0662	N/A	30128503417060000	614 Chestnut	CSOU Screening Level Data	1,690
505	A-0664	N/A	30128503417080000	606 Chestnut	CSOU Screening Level Data	891
506	A-0665	N/A	30128503417090000	600 Chestnut	CSOU Screening Level Data	700
507	A-0666	N/A	30128503417180000	621 Cedar	CSOU Screening Level Data	1,570
508	A-0667	N/A	30128503417040000	618 Chestnut	CSOU Screening Level Data	1,530
509	A-0668	N/A	30128503417170000	619 Cedar	CSOU Screening Level Data	1,070
510	A-0669	N/A	30128503417160000	617 Cedar	CSOU Screening Level Data	911

COMMUNITY SOILS OPERABLE UNIT
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Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
511	A-0670	N/A	30128503417150000	615 CEDAR ST.	CSOU Screening Level Data	1,910
512	A-0672	N/A	30128503417120000	607 Cedar	CSOU Screening Level Data	668
513	A-0673	N/A	30128503417110000	605 Cedar	CSOU Screening Level Data	410
514	A-0676	N/A	30128503406030000	718 Cedar	CSOU Screening Level Data	2,000
515	A-0678	N/A	30128503406050000	712 Cedar St	CSOU Screening Level Data	826
516	A-0679	N/A	30128503406060000	710 Cedar	CSOU Screening Level Data	873
517	A-0680	N/A	30128503406070000	708 Cedar	CSOU Screening Level Data	1,390
518	A-0681	N/A	30128503406080000	706 Cedar	CSOU Screening Level Data	772
519	A-0682	N/A	30128503406090000	700 Cedar	CSOU Screening Level Data	1,400
520	A-0683	N/A	30128503406100000	315 E. 7th Street	CSOU Screening Level Data	742
521	A-0684	N/A	30128503406190000	723 Cherry	CSOU Screening Level Data	697
522	A-0685	N/A	30128503406180000	719 Cherry	CSOU Screening Level Data	547
523	A-0686	N/A	30128503406170000	717 Cherry	CSOU Screening Level Data	676
524	A-0687	N/A	30128503406160000	715 Cherry	CSOU Screening Level Data	1,030
525	A-0688	N/A	30128503406150000	709 Cherry Street	CSOU Screening Level Data	612
526	A-0689	N/A	30128503406140000	707 Cherry	CSOU Screening Level Data	1,080
527	A-0690	N/A	30128503406130000	705 Cherry	CSOU Screening Level Data	832
528	A-0691	N/A	30128503406110000	307 E. 7th Street	CSOU Screening Level Data	583
529	A-0692	N/A	30128503406120000	701 Cherry	CSOU Screening Level Data	1,140
530	A-0693	N/A	30128503416020000	620 Cedar	CSOU Screening Level Data	855
531	A-0695	N/A	30128503416030000	616 Cedar	CSOU Screening Level Data	1,220
532	A-0696	N/A	30128503416040000	614 Cedar	CSOU Screening Level Data	809
533	A-0697	N/A	30128503416050000	612 Cedar	CSOU Screening Level Data	990
534	A-0698	N/A	30128503416060000	610 Cedar	CSOU Screening Level Data	1,270
535	A-0699	N/A	30128503416080000	606 Cedar	CSOU Screening Level Data	4,720
536	A-0700	N/A	30128503416090000	604 Cedar	CSOU Screening Level Data	1,530
537	A-0701	N/A	30128503416110000	315 E. 6th Street	CSOU Screening Level Data	802
538	A-0702	N/A	30128503416120000	313 E. 6th Street	CSOU Screening Level Data	439
539	A-0703	N/A	30128503416210000	621 Cherry	CSOU Screening Level Data	1,200
540	A-0705	N/A	30128503416190000	617 Cherry	CSOU Screening Level Data	1,210

COMMUNITY SOILS OPERABLE UNIT
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Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
541	A-0706	N/A	30128503416180000	615 Cherry	CSOU Screening Level Data	551
542	A-0708	N/A	30128503416160000	607 Cherry	CSOU Screening Level Data	1,880
543	A-0709	N/A	30128503416130000	311 E. 6th Street	CSOU Screening Level Data	784
544	A-0710	N/A	30128503416150000	601 Cherry	CSOU Screening Level Data	1,100
545	A-0711	N/A	30128503415030000	624 Cherry	CSOU Screening Level Data	844
546	A-0713	N/A	30128503415010000	214 E. 7th Street	CSOU Screening Level Data	753
547	A-0714	N/A	30128503415040000	620 Cherry	CSOU Screening Level Data	1,180
548	A-0715	N/A	30128503415050000	618 Cherry	CSOU Screening Level Data	1,620
549	A-0716	N/A	30128503415060000	614 Cherry	CSOU Screening Level Data	972
550	A-0717	N/A	30128503415070000	610 Cherry	CSOU Screening Level Data	808
551	A-0718	N/A	30128503415080000	604 Cherry	CSOU Screening Level Data	650
552	A-0719	N/A	30128503415100000	213 E. 6th Street	CSOU Screening Level Data	994
553	A-0720	N/A	30128503415180000	617 Oak	CSOU Screening Level Data	541
554	A-0721	N/A	30128503415170000	615 Oak	CSOU Screening Level Data	750
555	A-0722	N/A	30128503415160000	613 Oak	CSOU Screening Level Data	707
556	A-0723	N/A	30128503408140000	711 Chestnut	CSOU Screening Level Data	652
557	A-0725	N/A	30128503408130000	709 Chestnut	CSOU Screening Level Data	1,440
558	A-0726	N/A	30128503415120000	601 Oak	CSOU Screening Level Data	803
559	A-0728	N/A	30128503306030000	716 Oak	CSOU Screening Level Data	7,610
560	A-0730	N/A	30128503306040000	714 Oak	CSOU Screening Level Data	528
561	A-0731	N/A	30128503306050000	710 Oak	CSOU Screening Level Data	892
562	A-0732	N/A	30128503306060000	706 Oak	CSOU Screening Level Data	938
563	A-0733	N/A	30128503306070000	704 Oak	CSOU Screening Level Data	1,780
564	A-0734	N/A	30128503306080000	700 Oak	CSOU Screening Level Data	1,580
565	A-0735	N/A	30128503306090000	115 E. 7th Street	CSOU Screening Level Data	1,130
566	A-0737	N/A	30128503306140000	711 Main	CSOU Screening Level Data	751
567	A-0738	N/A	30128503306130000	709 Main	CSOU Screening Level Data	1,020
568	A-0739	N/A	30128503306120000	707 Main	CSOU Screening Level Data	744
569	A-0740	N/A	30128503306100000	105 E. 7th Street	CSOU Screening Level Data	2,430
570	A-0741	N/A	30128503306110000	701 Main	CSOU Screening Level Data	2,130

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
571	A-0744	N/A	30128503423020000	524 Cedar	CSOU Screening Level Data	876
572	A-0745	N/A	30128503423010000	312 E. 6th Street	CSOU Screening Level Data	1,380
573	A-0746	N/A	30128503423030000	518 Cedar	CSOU Screening Level Data	1,110
574	A-0747	N/A	30128503423040000	514 Cedar	CSOU Screening Level Data	3,290
575	A-0748	N/A	30128503423050000	512 Cedar	CSOU Screening Level Data	2,550
576	A-0749	N/A	30128503423060000	508 Cedar	CSOU Screening Level Data	673
577	A-0750	N/A	30128503423070000	506 Cedar	CSOU Screening Level Data	1,110
578	A-0751	N/A	30128503423080000	504 Cedar	CSOU Screening Level Data	879
579	A-0752	N/A	30128503423180000	513 Cherry	CSOU Screening Level Data	1,010
580	A-0753	N/A	30128503423220000	308 E. 6th Street	CSOU Screening Level Data	910
581	A-0756	N/A	30128503423200000	521 Cherry	CSOU Screening Level Data	911
582	A-0757	N/A	30128503423090000	500 Cedar	CSOU Screening Level Data	757
583	A-0758	N/A	30128503423190000	515 Cherry	CSOU Screening Level Data	1,500
584	A-0759	N/A	30128503423210000	306 E. 6th Street	CSOU Screening Level Data	594
585	A-0760	N/A	30128503423170000	511 Cherry Street	CSOU Screening Level Data	2,030
586	A-0761	N/A	30128503423150000	507 Cherry	CSOU Screening Level Data	921
587	A-0762	N/A	30128503423140000	505 Cherry	CSOU Screening Level Data	825
588	A-0763	N/A	30128503423120000	305 E. 5th Street	CSOU Screening Level Data	1,290
589	A-0764	N/A	30128503423130000	501 Cherry	CSOU Screening Level Data	801
590	A-0765	N/A	30128503422020000	520 Cherry	CSOU Screening Level Data	676
591	A-0766	N/A	30128503423160000	509 Cherry	CSOU Screening Level Data	1,360
592	A-0767	N/A	30128503422010000	212 E. 6th Street	CSOU Screening Level Data	628
593	A-0768	N/A	30128503422030000	518 Cherry	CSOU Screening Level Data	3,620
594	A-0769	N/A	30128503422040000	516 Cherry	CSOU Screening Level Data	3,970
595	A-0771	N/A	30128503422060000	510 Cherry	CSOU Screening Level Data	852
596	A-0772	N/A	30128503422070000	508 Cherry	CSOU Screening Level Data	1,250
597	A-0774	N/A	30128503415190000	621 Oak	CSOU Screening Level Data	790
598	A-0775	N/A	30128503415140000	611 Oak	CSOU Screening Level Data	1,630
599	A-0776	N/A	30128503415130000	607 Oak Street	CSOU Screening Level Data	749
600	A-0777	N/A	30128503422190000	519 Oak	CSOU Screening Level Data	1,730

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
601	A-0779	N/A	30128503422170000	517 Oak	CSOU Screening Level Data	2,210
602	A-0780	N/A	30128503422160000	513 Oak	CSOU Screening Level Data	1,850
603	A-0781	N/A	30128503422150000	511 Oak	CSOU Screening Level Data	1,080
604	A-0783	N/A	30128503422130000	505 Oak	CSOU Screening Level Data	841
605	A-0784	N/A	30128503422110000	209 E. 5th Street	CSOU Screening Level Data	583
606	A-0785	N/A	30128503422120000	501 Oak	CSOU Screening Level Data	3,220
607	A-0786	N/A	30128503421020000	518 Oak	CSOU Screening Level Data	743
608	A-0788	N/A	30128503421040000	512 Oak	CSOU Screening Level Data	662
609	A-0790	N/A	30128503421060000	119 E. 5th Street	CSOU Screening Level Data	1,130
610	A-0791	N/A	30128503408200000	508 E. 8th Street	CSOU Screening Level Data	499
611	A-0792	N/A	30128503432070000	410 Birch	CSOU Screening Level Data	1,680
612	A-0793	N/A	30128503422200000	521 Oak	CSOU Screening Level Data	972
613	A-0795	N/A	30128510101050000	509 E. 8th Street	CSOU Screening Level Data	408
614	A-0796	N/A	30128510101080000	513 E. 8th Street	CSOU Screening Level Data	859
615	A-0797	N/A	30128510101090000	800 Birch	CSOU Screening Level Data	624
616	A-0798	N/A	30128510101100000	802 Birch	CSOU Screening Level Data	670
617	A-0799	N/A	30128510101110000	804 Birch	CSOU Screening Level Data	887
618	A-0802	N/A	30128510101150000	814 Birch	CSOU Screening Level Data	546
619	A-0807	N/A	30128503432080000	406 Birch	CSOU Screening Level Data	1,450
620	A-0807	N/A	30128503432120000	406 Birch	CSOU Screening Level Data	1,450
621	A-0808	N/A	30128503422210000	210 E. 6th Street	CSOU Screening Level Data	924
622	A-0810	N/A	30128503408100000	515 E. &th Street	CSOU Screening Level Data	632
623	A-0811	N/A	30128503408090000	519 E. 7th Street	CSOU Screening Level Data	1,120
624	A-0812	N/A	30128503116110000	411 E. Front	CSOU Screening Level Data	3,850
625	A-0813	N/A	30128502311040000	1004 E. 5th Street	CSOU Screening Level Data	1,640
626	A-0815	N/A	30128502315060000	810 E. 4th Street	CSOU Screening Level Data	3,320
627	A-0816	N/A	30128510101010000	421 E. 8th Street	CSOU Screening Level Data	1,790
628	A-0817	N/A	30128503405060000	710 Cherry	CSOU Screening Level Data	1,210
629	A-0818	N/A	30128503416100000	600 Cedar	CSOU Screening Level Data	1,920
630	A-0819	N/A	30128503439040000	419 E. 3rd Street	CSOU Screening Level Data	1,060

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
631	A-0820	N/A	30128503439060000	415 E. 3rd Street	CSOU Screening Level Data	1,810
632	A-0821	N/A	30128503439080000	411 E. 3rd Street	CSOU Screening Level Data	1,150
633	A-0822	N/A	30128503439090000	409 E. 3rd Street	CSOU Screening Level Data	672
634	A-0823	N/A	30128503419080000	606 Alder	CSOU Screening Level Data	796
635	A-0824	N/A	30128503116060000	410 E. Commercial	CSOU Screening Level Data	1,590
636	A-0825	N/A	30128503116070000	408 E. Commercial	CSOU Screening Level Data	788
637	A-0826	N/A	30128503116080000	402 E. Commercial	CSOU Screening Level Data	1,350
638	A-0828	N/A	30128503114190000	2 Cherry	CSOU Screening Level Data	557
639	A-0829	N/A	30128502330010000	113 Washington Street	EPA 2007 Data	693
640	A-0830	N/A	30128502321030000	704 & 706 & 708 E. 3rd	CSOU Screening Level Data	1,240
641	A-0831	N/A	30128503118220000	621 E. Front	CSOU Screening Level Data	712
642	A-0832	N/A	30128503117020000	520 E. Commercial	CSOU Screening Level Data	1,550
643	A-0833	N/A	30128502315070000	812 E. 4th Street	CSOU Screening Level Data	1,900
644	A-0835	N/A	30128502310070000	910 E. 5th Street	CSOU Screening Level Data	565
645	A-0837	N/A	30128502303150000	811 E. 5th Street	CSOU Screening Level Data	675
646	A-0838	N/A	30128502303100000	822 E. 6th Street	CSOU Screening Level Data	527
647	A-0839	N/A	30128502301050000	813 E. 6th Street	CSOU Screening Level Data	743
648	A-0840	N/A	30128503411030000	807 E. 7th Street	CSOU Screening Level Data	1,490
649	A-0841	N/A	30128502327030000	1204 E. 3rd Street	CSOU Screening Level Data	1,090
650	A-0842	N/A	30128503329020000	420 Main	CSOU Screening Level Data	866
651	A-0843	N/A	30128503430210000	419 Cherry	CSOU Screening Level Data	698
652	A-0844	N/A	30128503430200000	417 Cherry	CSOU Screening Level Data	2,250
653	A-0845	N/A	30128503422100000	207 E. 5th Street	CSOU Screening Level Data	1,280
654	A-0848	N/A	30128503218120000	108 Elm	CSOU Screening Level Data	1,750
655	A-0849	N/A	30128503218080000	502 W. Park	CSOU Screening Level Data	1,840
656	A-0852	N/A	30128503213170000	422 W. 3rd Street	CSOU Screening Level Data	10,900
657	A-0853	N/A	30128503206210000	309, 311 Elm	CSOU Screening Level Data	634
658	A-0854	N/A	30128503205100000	312 Elm	CSOU Screening Level Data	1,230
659	A-0856	N/A	30128503326170000	419 Elm	CSOU Screening Level Data	1,020
660	A-0857	N/A	30128503326180000	423 Elm	CSOU Screening Level Data	797

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
661	A-0858	N/A	30128503208010000	313 Locust	CSOU Screening Level Data	586
662	A-0860	N/A	30128503317040000	520 Pine	CSOU Screening Level Data	1,330
663	A-0861	N/A	30128503310110000	519 W. 6th Street	CSOU Screening Level Data	568
664	A-0862	N/A	30128503310060000	608 & 610 Elm	CSOU Screening Level Data	667
665	A-0863	N/A	30128503311110000	613 Elm	CSOU Screening Level Data	5,860
666	A-0864	N/A	30128503311010000	620 Maple	CSOU Screening Level Data	2,430
667	A-0867	N/A	30128502315200000	801 E. 3rd Street	CSOU Screening Level Data	1,210
668	A-0868	N/A	30128503214120000	214 Locust	CSOU Screening Level Data	1,400
669	A-0869	N/A	30128503215130000	223 Locust	CSOU Screening Level Data	1,070
670	A-0872	N/A	30128503117070000	506 E. Commercial	EPA 2007 Data	4,330
671	A-0874	N/A	30128502310180000	909 E. 4th Street	CSOU Screening Level Data	1,250
672	A-0875	N/A	30128502305090000	1016 E. 6th Street	CSOU Screening Level Data	462
673	A-0887	N/A	30128502309040000	804 E. 5th Street	CSOU Screening Level Data	1,260
674	A-0888	N/A	30128502335030000	716 E. Commercial	CSOU Screening Level Data	635
675	A-0890	N/A	30128503406010000	316 E. 8th Street	CSOU Screening Level Data	803
676	A-0891	N/A	30128503415110000	211 E. 6th Street	CSOU Screening Level Data	805
677	A-0893	N/A	30128502315210000	303 Ash	CSOU Screening Level Data	668
678	A-0895	N/A	30128502307040000	1206 E. 6th Street	CSOU Screening Level Data	423
679	A-0896	N/A	30128502327130000	1223 Park	CSOU Screening Level Data	1,010
680	A-0899	N/A	30128503319050000	514 Maple	CSOU Screening Level Data	780
681	A-0901	N/A	30128503438040000	310 E. 4th Street	CSOU Screening Level Data	859
682	A-0902	N/A	30128503438030000	308 E. 4th Street	CSOU Screening Level Data	842
683	A-0903	N/A	30128503438020000	302 E. 4th Street	CSOU Screening Level Data	1,290
684	A-0905	N/A	30128503319060000	510 Maple	CSOU Screening Level Data	698
685	A-0907	N/A	30128504408040000	906 W. 4th Street	CSOU Screening Level Data	922
686	A-0908	N/A	30128502304130000	911 E. 5th Street	CSOU Screening Level Data	817
687	A-0911	N/A	30128503411020000	809 E. 7th Street	CSOU Screening Level Data	1,720
688	A-0912	N/A	30128503111110000	519 E. Commercial	CSOU Screening Level Data	563
689	A-0914	N/A	30128503111090000	523 E. Commercial	CSOU Screening Level Data	600
690	A-0915	N/A	30128504406080000	905 W. 4th Street	CSOU Screening Level Data	773

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
691	A-0917	N/A	30128503430180000	411 Cherry	CSOU Screening Level Data	938
692	A-0918	N/A	30128504406100000	909 W. 4th Street	CSOU Screening Level Data	540
693	A-0919	N/A	30137734401260000	36 Washoe Park	CSOU Screening Level Data	539
694	A-0920	N/A	30137734401240000	32 Washoe Park	CSOU Screening Level Data	531
695	A-0921	N/A	30137734401230000	30 Washoe Park	CSOU Screening Level Data	546
696	A-0922	N/A	30137734401220000	28 Washoe Park	CSOU Screening Level Data	518
697	A-0927	N/A	30137734401160000	18 Washoe Park	CSOU Screening Level Data	598
698	A-0933	N/A	30137734401040000	Washoe Park	CSOU Screening Level Data	423
699	A-0944	N/A	30128503112090000	615 E. Commercial	EPA 2007 Data	1,650
700	A-0945	N/A	30128503114090000	9 Oak	CSOU Screening Level Data	994
701	A-0946	N/A	30128503114150000	213 Front	CSOU Screening Level Data	611
702	A-0947	N/A	30128503114180000	215 E. Front Street	CSOU Screening Level Data	637
703	A-0948	N/A	30128503114200000	6 Cherry	CSOU Screening Level Data	583
704	A-0949	N/A	30128503114210000	8 Cherry	CSOU Screening Level Data	1,710
705	A-0951	N/A	30128503115090000	309 East Front Street	EPA 2007 Data	2,090
706	A-0953	N/A	30128503115110000	311 East Front Street	EPA 2007 Data	501
707	A-0955	N/A	30128503115150000	10 Cedar Street	CSOU Screening Level Data	650
708	A-0957	N/A	30128503116120000	413 Front	CSOU Screening Level Data	474
709	A-0958	N/A	30128503116130000	415 Front	CSOU Screening Level Data	629
710	A-0961	N/A	30128503116160000	8 Chestnut	CSOU Screening Level Data	669
711	A-0963	N/A	30128503116010000	422 Commercial	CSOU Screening Level Data	789
712	A-0965	N/A	30128503116030000	418 E. Commercial	CSOU Screening Level Data	589
713	A-0967	N/A	30128503116050000	412 E. Commercial	CSOU Screening Level Data	1,480
714	A-0968	N/A	30128503117090000	5 Chestnut	CSOU Screening Level Data	2,180
715	A-0970	N/A	30128503117120000	509 E. Front	CSOU Screening Level Data	716
716	A-0972.1	N/A	30128503117150000	521 Front	CSOU Screening Level Data	1,140
717	A-0973	N/A	30128503117170000	10 Birch	CSOU Screening Level Data	612
718	A-0974	N/A	30128503117180000	12 Birch	EPA 2007 Data	1,190
719	A-0976	N/A	30128503117010000	522 Commercial	CSOU Screening Level Data	1,930
720	A-0980	N/A	3012850311708000A	9 Chestnut	CSOU Screening Level Data	669

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
721	A-0985	N/A	30128503118150000	603 E. Front	CSOU Screening Level Data	652
722	A-0986	N/A	30128503118160000	605 E. Front	CSOU Screening Level Data	439
723	A-0989	N/A	30128503118190000	615 E. Front Street	CSOU Screening Level Data	583
724	A-0990	N/A	30128503118200000	617 Front	CSOU Screening Level Data	488
725	A-0992	N/A	30128503118230000	12 Alder	CSOU Screening Level Data	662
726	A-0993	N/A	30128503118010000	624 Commercial Street	CSOU Screening Level Data	497
727	A-0994	N/A	30128503118020000	620 E. Commercial	CSOU Screening Level Data	701
728	A-0995	N/A	30128503118040000	616 E. Commercial	CSOU Screening Level Data	2,570
729	A-0996	N/A	30128503118050000	614 Commercial Street	CSOU Screening Level Data	2,090
730	A-0998	N/A	30128503118070000	610 E. Commercial	CSOU Screening Level Data	983
731	A-0999	N/A	30128503118080000	608 E. Commercial	CSOU Screening Level Data	756
732	A-1000	N/A	30128503118090000	606 E. Commercial	CSOU Screening Level Data	796
733	A-1001	N/A	30128503118100000	600 E. Commercial	CSOU Screening Level Data	596
734	A-1004	N/A	30128503111200000	111 Chestnut	CSOU Screening Level Data	980
735	A-1008	N/A	30128503111160000	507 E. Commercial	CSOU Screening Level Data	1,200
736	A-1015	N/A	30128503112130000	609 E. Commercial	CSOU Screening Level Data	682
737	A-1016	N/A	30128503112120000	611 E. Commercial	CSOU Screening Level Data	1,290
738	A-1017	N/A	30128503112110000	613 Commercial	CSOU Screening Level Data	1,180
739	A-1020	N/A	30128503105080000	214 Chestnut Street	EPA 2007 Data	427
740	A-1021	N/A	30128503105100000	220 Chestnut	CSOU Screening Level Data	3,550
741	A-1025	N/A	30128503105150000	412 E. 3rd	CSOU Screening Level Data	1,170
742	A-1028	N/A	30128503443100000	522 3rd	CSOU Screening Level Data	2,520
743	A-1030	N/A	30128503443130000	510 E. 3rd	CSOU Screening Level Data	1,190
744	A-1031	N/A	30128503443140000	508 E. 3rd	CSOU Screening Level Data	909
745	A-1032	N/A	30128503443160000	504 E. 3rd	CSOU Screening Level Data	540
746	A-1033	N/A	30128503443180000	221 Chestnut	CSOU Screening Level Data	4,040
747	A-1035	N/A	30128503443200000	215 Chestnut	CSOU Screening Level Data	4,390
748	A-1036	N/A	30128503444030000	613 E. Park	CSOU Screening Level Data	1,360
749	A-1037	N/A	30128503444040000	615 E. Park	CSOU Screening Level Data	1,040
750	A-1038	N/A	30128503444050000	617 E. Park	CSOU Screening Level Data	426

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
751	A-1039	N/A	30128503444060000	619 E. Park	CSOU Screening Level Data	692
752	A-1040	N/A	30128503444070000	621 E. Park	CSOU Screening Level Data	1,830
753	A-1041	N/A	30128503444080000	623 Park	CSOU Screening Level Data	1,060
754	A-1043	N/A	30128503444120000	618 E. 3rd	CSOU Screening Level Data	701
755	A-1045	N/A	30128503444150000	612 E. 3rd	CSOU Screening Level Data	824
756	A-1046	N/A	30128503444160000	608 E. 3rd	CSOU Screening Level Data	1,120
757	A-1047	N/A	30128503444170000	604 E. 3rd	CSOU Screening Level Data	3,560
758	A-1048	N/A	30128503444190000	213 Birch	CSOU Screening Level Data	1,090
759	A-1049	N/A	30128502321150000	709 E. Park	CSOU Screening Level Data	553
760	A-1051	N/A	30128502321130000	715 Park Street	CSOU Screening Level Data	567
761	A-1052	N/A	30128502321120000	717 E. Park	CSOU Screening Level Data	466
762	A-1054	N/A	30128502321020000	215 Alder	CSOU Screening Level Data	1,240
763	A-1055	N/A	30128502321010000	702 E. 3rd.	CSOU Screening Level Data	971
764	A-1056.1	N/A	30128502321040000	712 3rd Street	CSOU Screening Level Data	828
765	A-1056.2	N/A	30128502321040000	712 3rd Street	CSOU Screening Level Data	1,100
766	A-1057	N/A	30128502321050000	716 3rd Street	CSOU Screening Level Data	527
767	A-1058	N/A	30128502321060000	718 E. 3rd	CSOU Screening Level Data	963
768	A-1060	N/A	30128502321090000	214 Ash	CSOU Screening Level Data	2,290
769	A-1062	N/A	30128503438140000	305 E. 3rd Street	CSOU Screening Level Data	1,850
770	A-1064	N/A	30128503438110000	321 E 3rd. St.	CSOU Screening Level Data	632
771	A-1065	N/A	30128503438100000	310 Cedar	CSOU Screening Level Data	1,010
772	A-1068	N/A	30128503438060000	314 E. 4th Street	CSOU Screening Level Data	838
773	A-1069	N/A	30128503438090000	312 Cedar	CSOU Screening Level Data	1,230
774	A-1070	N/A	30128503438080000	314 Cedar	CSOU Screening Level Data	994
775	A-1073	N/A	30128503439110000	401 E. 3rd Street	CSOU Screening Level Data	1,360
776	A-1074	N/A	30128503439100000	407 E. 3rd Street	CSOU Screening Level Data	2,390
777	A-1075	N/A	30128503439070000	413 E. 3rd Street	CSOU Screening Level Data	2,690
778	A-1076	N/A	30128503439050000	417 E. 3rd	CSOU Screening Level Data	626
779	A-1078	N/A	30128503440170000	503 3rd	CSOU Screening Level Data	639
780	A-1079	N/A	30128503440160000	505 & 507 E. 3rd Street	CSOU Screening Level Data	522

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
781	A-1080	N/A	30128503440150000	509 3rd	CSOU Screening Level Data	1,240
782	A-1084	N/A	30128503440030000	508 4th	CSOU Screening Level Data	1,210
783	A-1087	N/A	30128503440060000	516 E. 4th Street	CSOU Screening Level Data	1,390
784	A-1090	N/A	30128503441180000	609 E. 3rd Street	CSOU Screening Level Data	717
785	A-1091	N/A	30128503441190000	605 E. 3rd Street	CSOU Screening Level Data	1,120
786	A-1092	N/A	30128503441170000	611 E. 3rd Street	CSOU Screening Level Data	1,120
787	A-1094	N/A	30128503441150000	615 E. 3rd Street	CSOU Screening Level Data	427
788	A-1096	N/A	30128503441130000	619 E. 3rd Street	CSOU Screening Level Data	581
789	A-1098	N/A	30128503441100000	310 Alder	CSOU Screening Level Data	453
790	A-1100	N/A	30128503441020000	321 Birch	CSOU Screening Level Data	842
791	A-1101	N/A	30128503441030000	604 E. 4th Street	CSOU Screening Level Data	1,130
792	A-1102	N/A	30128503441040000	608 E. 4th Street	CSOU Screening Level Data	661
793	A-1103	N/A	30128503441050000	612 E. 4th St.	CSOU Screening Level Data	476
794	A-1104	N/A	30128503441060000	616 E. 4th Street	CSOU Screening Level Data	625
795	A-1105	N/A	30128503441070000	324 Alder	CSOU Screening Level Data	672
796	A-1106	N/A	30128503441080000	322 Alder Street	CSOU Screening Level Data	733
797	A-1107	N/A	30128503441090000	314 Alder Street	CSOU Screening Level Data	662
798	A-1108	N/A	30128503442220000	311 Alder	CSOU Screening Level Data	913
799	A-1112	N/A	30128503442180000	707 E. 3rd Street	CSOU Screening Level Data	1,730
800	A-1113	N/A	30128503442170000	709 E. 3rd Street	CSOU Screening Level Data	778
801	A-1115	N/A	30128503442150000	717 E. 3rd Street	CSOU Screening Level Data	957
802	A-1116	N/A	30128503442140000	719 3rd Street	CSOU Screening Level Data	783
803	A-1118	N/A	30128503442120000	723 E. 3rd Street	CSOU Screening Level Data	1,180
804	A-1119	N/A	30128503442110000	304 Ash	CSOU Screening Level Data	1,420
805	A-1122	N/A	30128503442050000	712 E. 4th Street	CSOU Screening Level Data	624
806	A-1124	N/A	30128503442070000	716 E. 4th Street	CSOU Screening Level Data	628
807	A-1126	N/A	30128503442100000	318 Ash	CSOU Screening Level Data	759
808	A-1127	N/A	30128503442090000	720 E. 4th Street	CSOU Screening Level Data	802
809	A-1128	N/A	30128502315190000	803 E. 3rd	CSOU Screening Level Data	1,540
810	A-1130	N/A	30128502315170000	807 E. 3rd	CSOU Screening Level Data	1,530

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
811	A-1131	N/A	30128502315160000	809 E. 3rd	CSOU Screening Level Data	1,790
812	A-1132	N/A	30128502315150000	811 E. 3rd	CSOU Screening Level Data	1,820
813	A-1134	N/A	30128502315130000	815 E. 3rd	CSOU Screening Level Data	2,130
814	A-1136	N/A	30128502315020000	800 E. 4th Street	CSOU Screening Level Data	1,790
815	A-1137	N/A	30128502315030000	804 E. 4th Street	CSOU Screening Level Data	1,270
816	A-1138	N/A	30128502315040000	806 E. 4th Street	CSOU Screening Level Data	877
817	A-1139	N/A	30128502315050000	808 E. 4th Street	CSOU Screening Level Data	1,190
818	A-1141	N/A	30128502315090000	820 E. 4th Street	CSOU Screening Level Data	769
819	A-1143	N/A	30128502315110000	312 Washington	CSOU Screening Level Data	3,940
820	A-1144	N/A	30128502316240000	309 Washington	CSOU Screening Level Data	431
821	A-1145	N/A	30128502316230000	307 Washington	CSOU Screening Level Data	1,490
822	A-1146	N/A	30128502316210000	905 E. 3rd Street	CSOU Screening Level Data	780
823	A-1149	N/A	30128502316170000	913 E. 3rd	CSOU Screening Level Data	768
824	A-1150	N/A	30128502316150000	917 E. 3rd Street	EPA 2007 Data	1,480
825	A-1152A	N/A	30128502316010000	311 Washington	CSOU Screening Level Data	1,150
826	A-1152B	N/A	30128502316010000	315 Washington	CSOU Screening Level Data	943
827	A-1154	N/A	30128502316030000	900 E. 4th	CSOU Screening Level Data	723
828	A-1155	N/A	30128502316040000	908 E. 4th	CSOU Screening Level Data	599
829	A-1156	N/A	30128502316060000	910 E. 4th	CSOU Screening Level Data	600
830	A-1157	N/A	30128502316080000	914 E. 4th Street	CSOU Screening Level Data	1,280
831	A-1158	N/A	30128502316090000	914 E. 4th	CSOU Screening Level Data	513
832	A-1159	N/A	30128502316100000	916 E. 4th	CSOU Screening Level Data	1,110
833	A-1160	N/A	30128502316110000	918 E. 4th	CSOU Screening Level Data	1,030
834	A-1161	N/A	30128502316120000	314 Adams	CSOU Screening Level Data	764
835	A-1162	N/A	30128503430150000	401 Cherry Street	CSOU Screening Level Data	1,540
836	A-1163	N/A	30128503430140000	309 E. 4th Street	CSOU Screening Level Data	923
837	A-1164	N/A	30128503430160000	407 Cherry	CSOU Screening Level Data	897
838	A-1166	N/A	30128503430190000	415 Cherry	CSOU Screening Level Data	1,510
839	A-1167	N/A	30128503430220000	421 Cherry	CSOU Screening Level Data	1,040
840	A-1169	N/A	30128503430130000	313 E. 4th Street	CSOU Screening Level Data	510

COMMUNITY SOILS OPERABLE UNIT
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ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
841	A-1172	N/A	30128503430100000	406 Cedar	CSOU Screening Level Data	925
842	A-1173	N/A	30128503430090000	408 Cedar	CSOU Screening Level Data	1,680
843	A-1174	N/A	30128503430080000	410 Cedar	CSOU Screening Level Data	1,670
844	A-1175	N/A	30128503430070000	412 Cedar	CSOU Screening Level Data	1,340
845	A-1177	N/A	30128503430050000	418 Cedar Street	CSOU Screening Level Data	814
846	A-1184	N/A	30128503431160000	409 Cedar Street	EPA 2007 Data	461
847	A-1185	N/A	30128503431170000	415 Cedar Street	EPA 2007 Data	412
848	A-1189	N/A	30128503431110000	413 E. 4th Street	CSOU Screening Level Data	706
849	A-1191	N/A	30128503431080000	406 Chestnut	CSOU Screening Level Data	753
850	A-1192	N/A	30128503431070000	408 Chestnut	CSOU Screening Level Data	879
851	A-1195	N/A	30128503431040000	418 Chestnut	CSOU Screening Level Data	512
852	A-1196	N/A	30128503431020000	422 Chestnut	CSOU Screening Level Data	750
853	A-1200	N/A	30128502309180000	803 E. 4th	CSOU Screening Level Data	473
854	A-1202	N/A	30128502309160000	807 E. 4th Street	CSOU Screening Level Data	858
855	A-1203	N/A	30128502309150000	809 E. 4th Street	CSOU Screening Level Data	1,090
856	A-1204	N/A	30128502309020000	800 E. 5th	CSOU Screening Level Data	772
857	A-1205	N/A	30128502309010000	415 Ash	CSOU Screening Level Data	553
858	A-1208	N/A	30128502309070000	812 E. 5th Street	CSOU Screening Level Data	1,570
859	A-1209	N/A	30128502309080000	814 E. 5th Street	CSOU Screening Level Data	3,600
860	A-1210	N/A	30128502309090000	816 E. 5th	CSOU Screening Level Data	1,720
861	A-1211	N/A	30128502309100000	818 E. 5th	CSOU Screening Level Data	637
862	A-1213	N/A	30128502310220000	901 E. 4th	CSOU Screening Level Data	772
863	A-1214	N/A	30128502310230000	409 Washington	CSOU Screening Level Data	1,250
864	A-1215	N/A	30128502310210000	903 E. 4th	CSOU Screening Level Data	908
865	A-1216	N/A	30128502310200000	905 E. 4th	CSOU Screening Level Data	1,130
866	A-1217	N/A	30128502310190000	907 E. 4th Street	CSOU Screening Level Data	2,060
867	A-1218	N/A	30128502310170000	911 E. 4th	CSOU Screening Level Data	433
868	A-1219	N/A	30128502310160000	913 E. 4th	CSOU Screening Level Data	1,110
869	A-1224	N/A	30128502310100000	916 E. 5th	CSOU Screening Level Data	1,370
870	A-1226	N/A	30128502310080000	912 E. 5th	CSOU Screening Level Data	743

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
871	A-1228	N/A	30128502310050000	906 E. 5th.	CSOU Screening Level Data	615
872	A-1229	N/A	30128502310030000	902 E. 5th	CSOU Screening Level Data	1,090
873	A-1230	N/A	30128502310020000	900 E. 5th Street	CSOU Screening Level Data	975
874	A-1231	N/A	30128502303200000	801 E. 5th Street	CSOU Screening Level Data	1,150
875	A-1232	N/A	30128502303190000	803 E. 5th Street	CSOU Screening Level Data	561
876	A-1233	N/A	30128502303180000	805 E. 5th Street	CSOU Screening Level Data	1,120
877	A-1234	N/A	30128502303170000	807 E. 5th Street	CSOU Screening Level Data	830
878	A-1235	N/A	30128502303160000	809 E. 5th Street	CSOU Screening Level Data	1,480
879	A-1236	N/A	30128502303140000	815 E. 5th	CSOU Screening Level Data	823
880	A-1237	N/A	30128502303130000	817 E. 5th	CSOU Screening Level Data	804
881	A-1238	N/A	30128502303120000	819 E. 5th	CSOU Screening Level Data	1,040
882	A-1239	N/A	30128502303110000	821 E. 5th	CSOU Screening Level Data	567
883	A-1240	N/A	30128502303010000	511 Ash Street	CSOU Screening Level Data	891
884	A-1241	N/A	30128502303040000	804 E. 6th	CSOU Screening Level Data	767
885	A-1244	N/A	30128502303070000	810 E. 6th Street	CSOU Screening Level Data	537
886	A-1245	N/A	30128502303080000	818 E. 6th	CSOU Screening Level Data	1,760
887	A-1247	N/A	30128502304180000	901 E. 5th Street	CSOU Screening Level Data	599
888	A-1248	N/A	30128502304170000	903 E. 5th Street	CSOU Screening Level Data	1,410
889	A-1249	N/A	30128502304190000	511 Washington	CSOU Screening Level Data	1,050
890	A-1250	N/A	30128502304160000	905 E. 5th Street	CSOU Screening Level Data	1,400
891	A-1252	N/A	30128502304140000	909 E. 5th Street	CSOU Screening Level Data	811
892	A-1255	N/A	30128502304010000	515 Washington	CSOU Screening Level Data	721
893	A-1256	N/A	30128502304020000	900 E. 6th Street	CSOU Screening Level Data	482
894	A-1257	N/A	30128502304030000	902 E. 6th Street	CSOU Screening Level Data	802
895	A-1259	N/A	30128502304060000	908 E. 6th Street	CSOU Screening Level Data	692
896	A-1260	N/A	30128502304070000	910 E. 6th Street	CSOU Screening Level Data	719
897	A-1261	N/A	30128502304080000	912 E. 6th Street	CSOU Screening Level Data	1,730
898	A-1263	N/A	30128502301070000	601 Ash	CSOU Screening Level Data	465
899	A-1264	N/A	30128502301060000	807 E. 6th Street	CSOU Screening Level Data	1,060
900	A-1265	N/A	30128502301080000	607 Ash	CSOU Screening Level Data	852

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
901	A-1266	N/A	30128502301090000	609 Ash	CSOU Screening Level Data	780
902	A-1267	N/A	30128502301100000	615 Ash	CSOU Screening Level Data	792
903	A-1268	N/A	30128502301130000	623 Ash	CSOU Screening Level Data	778
904	A-1269	N/A	30128502301140000	806 E. 7th Street	CSOU Screening Level Data	1,920
905	A-1271	N/A	30128502301040000	815 E. 6th Street	CSOU Screening Level Data	671
906	A-1273	N/A	30128502301010000	821 E.6th St.	CSOU Screening Level Data	629
907	A-1274	N/A	30128503411050000	801 E. 7th Street	CSOU Screening Level Data	1,540
908	A-1275	N/A	30128503411040000	803 E. 7th Street	CSOU Screening Level Data	587
909	A-1278	N/A	30128503405110000	211 E 7th street	CSOU Screening Level Data	790
910	A-1279	N/A	30128503405130000	705 Oak Street	CSOU Screening Level Data	2,290
911	A-1280	N/A	30128503405140000	709 Oak	CSOU Screening Level Data	714
912	A-1281	N/A	30128503405150000	715 Oak	CSOU Screening Level Data	709
913	A-1283	N/A	30128503405170000	719 Oak	CSOU Screening Level Data	673
914	A-1284	N/A	30128503405180000	721 Oak	CSOU Screening Level Data	702
915	A-1285	N/A	30128503405190000	210 E. 8th Street	CSOU Screening Level Data	1,570
916	A-1286	N/A	30128503405100000	213 E. 7th Street	CSOU Screening Level Data	451
917	A-1287	N/A	30128503405090000	700 Cherry Street	CSOU Screening Level Data	2,000
918	A-1288	N/A	30128503405080000	704 Cherry Street	CSOU Screening Level Data	698
919	A-1289	N/A	30128503405070000	706 Cherry	CSOU Screening Level Data	1,480
920	A-1290	N/A	30128503405050000	714 Cherry	CSOU Screening Level Data	927
921	A-1291	N/A	30128503405040000	718 Cherry	CSOU Screening Level Data	1,030
922	A-1292	N/A	30128503405030000	720 Cherry	CSOU Screening Level Data	1,150
923	A-1293	N/A	30128503405010000	212 E. 8th Street	CSOU Screening Level Data	606
924	A-1296	N/A	30128503114100000	5 Oak	CSOU Screening Level Data	1,180
925	A-1297	N/A	30128503203130000	721 W. 3rd Street	CSOU Screening Level Data	739
926	A-1298	N/A	30128503214020000	319 W. Park	CSOU Screening Level Data	1,980
927	A-1300	N/A	30128502305040000	1006 E. 6th	CSOU Screening Level Data	1,990
928	A-1301	N/A	30128503401080000	809 Oak	CSOU Screening Level Data	528
929	A-1302	N/A	30128502305060000	1010 E. 6th Street	CSOU Screening Level Data	3,240
930	A-1303	N/A	30128503401060000	203 E. 8th	CSOU Screening Level Data	1,300

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
931	A-1304	N/A	30128503208080000	318 Hickory	CSOU Screening Level Data	1,400
932	A-1306	N/A	30128502305160000	1007 E. 5th	CSOU Screening Level Data	874
933	A-1307	N/A	30128502305030000	1004 E. 6th	CSOU Screening Level Data	481
934	A-1308	N/A	30128503402060000	317 E. 8th	CSOU Screening Level Data	505
935	A-1310	N/A	30128503206170000	415 W. 3rd Street	CSOU Screening Level Data	1,380
936	A-1311	N/A	30128502305150000	1009 E. 5th	CSOU Screening Level Data	1,160
937	A-1312	N/A	30128502305180000	1001 E. 5th	CSOU Screening Level Data	861
938	A-1313	N/A	30128502305070000	1012 E. 6th Street	CSOU Screening Level Data	3,410
939	A-1314	N/A	30128502305140000	1011 E. 5th	CSOU Screening Level Data	958
940	A-1315	N/A	30128502305130000	1013 E. 5th	CSOU Screening Level Data	5,720
941	A-1317	N/A	30128502305050000	1008 E. 6th Street	CSOU Screening Level Data	858
942	A-1320	N/A	30128503310080000	600 Elm	CSOU Screening Level Data	864
943	A-1322	N/A	30128503312010000	620 Locust	CSOU Screening Level Data	1,830
944	A-1324	N/A	30128503312020000	618 Locust	CSOU Screening Level Data	1,670
945	A-1325	N/A	30128503313160000	218 W. 7th Street	CSOU Screening Level Data	1,210
946	A-1326	N/A	30128503401090000	813 Oak	CSOU Screening Level Data	614
947	A-1327	N/A	30128502305120000	1015 E. 5th	CSOU Screening Level Data	582
948	A-1328	N/A	30128502305080000	1014 E. 6th	CSOU Screening Level Data	905
949	A-1329	N/A	30128503212050000	214 Elm	CSOU Screening Level Data	521
950	A-1330	N/A	30128503206010000	315 Elm	CSOU Screening Level Data	1,230
951	A-1331	N/A	30128503317010000	612 W. 6th Street	CSOU Screening Level Data	543
952	A-1332	N/A	30128502316200000	907 E. 3rd	CSOU Screening Level Data	599
953	A-1334	N/A	30128503409150000	709 Birch	CSOU Screening Level Data	1,400
954	A-1339	N/A	30128504404050000	1115 W. 4th Street	CSOU Screening Level Data	672
955	A-1341	N/A	30128503216010000	722 W. Park	CSOU Screening Level Data	1,640
956	A-1342	N/A	30128503117030000	518 E. Commercial	CSOU Screening Level Data	539
957	A-1343	N/A	30128503212110000	520 W. 3rd Street	CSOU Screening Level Data	711
958	A-1344	N/A	30128503308090000	604 Walnut	CSOU Screening Level Data	687
959	A-1345	N/A	30128503214050000	311 W. Park	CSOU Screening Level Data	584
960	A-1346	N/A	30128510102290000	611 E. 9th	CSOU Screening Level Data	936

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ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
961	A-1347	N/A	30128502305170000	1003 E. 5th	CSOU Screening Level Data	698
962	A-1351	N/A	30128503435130000	401 & 405 Alder	CSOU Screening Level Data	773
963	A-1353	N/A	30128503210100000	700 W. 3rd Street	CSOU Screening Level Data	1,870
964	A-1354	N/A	30128503202100000	805 W. 3rd Street	CSOU Screening Level Data	672
965	A-1355	N/A	30128503202090000	310 Spruce	CSOU Screening Level Data	627
966	A-1356	N/A	30128503211160000	620 W. 3rd Street	CSOU Screening Level Data	753
967	A-1357	N/A	30128503213120000	410 W. 3rd Street	CSOU Screening Level Data	3,010
968	A-1358	N/A	30128503213110000	406 W. 3rd Street	CSOU Screening Level Data	842
969	A-1359	N/A	30128503214190000	320 W. 3rd Street	CSOU Screening Level Data	986
970	A-1360	N/A	30128503214170000	316 W. 3rd Street	CSOU Screening Level Data	941
971	A-1361	N/A	30128503214130000	302 W. 3rd Street	CSOU Screening Level Data	739
972	A-1362	N/A	30128503318070000	508 Elm	CSOU Screening Level Data	1,010
973	A-1363	N/A	30128503308110000	709 W. 6th	CSOU Screening Level Data	1,250
974	A-1364	N/A	30128503309200000	622 W. 7th Street	CSOU Screening Level Data	618
975	A-1365	N/A	30128503311100000	611 Elm	CSOU Screening Level Data	862
976	A-1366	N/A	30128503322020000	510 Main	CSOU Screening Level Data	1,180
977	A-1367	N/A	30128503303080000	700 Locust	CSOU Screening Level Data	1,000
978	A-1368	N/A	30128503401050000	205 E. 8th Street	CSOU Screening Level Data	1,830
979	A-1370	N/A	30128510102090000	719 E. 8th Street	CSOU Screening Level Data	490
980	A-1372	N/A	30128502334070000	107 Madison	CSOU Screening Level Data	865
981	A-1373	N/A	30128503217100000	604 W. Park	CSOU Screening Level Data	742
982	A-1374	N/A	30128503214210000	209 Maple	CSOU Screening Level Data	895
983	A-1375	N/A	30128503204010000	620 W. 4th Street	CSOU Screening Level Data	1,320
984	A-1377	N/A	30128503206070000	408/410 W. 4th Street	CSOU Screening Level Data	1,110
985	A-1381	N/A	30128503320110000	321 W. 5th Street	CSOU Screening Level Data	892
986	A-1383	N/A	30128503309210000	612 W. 7th Street	CSOU Screening Level Data	1,050
987	A-1386	N/A	30128502323090000	914 E. 3rd Street	CSOU Screening Level Data	850
988	A-1388	N/A	30128503314060000	606 Main	CSOU Screening Level Data	1,850
989	A-1390	N/A	30128503328010000	422 Hickory	CSOU Screening Level Data	1,200
990	A-1391	N/A	30128503203020000	321 Spruce	CSOU Screening Level Data	1,870

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
991	A-1393	N/A	30137734401130000	6 Washoe Park	CSOU Screening Level Data	593
992	A-1408	N/A	30128503110060000	420 E. Park	CSOU Screening Level Data	430
993	A-1410	N/A	30128503308080000	608 Walnut	CSOU Screening Level Data	1,090
994	A-1411.1	N/A	30128503122070000	107 N. Main	CSOU Screening Level Data	737
995	A-1411.2	N/A	30128503122070000	107 N. Main	CSOU Screening Level Data	548
996	A-1413	N/A	30128503123060000	100 N. Main	CSOU Screening Level Data	998
997	A-1416	N/A	30128503115120000	313 Front Street	CSOU Screening Level Data	625
998	A-1417	N/A	30128503211140000	614 W 3rd Street	CSOU Screening Level Data	702
999	A-1419	N/A	30128503326080000	400 Maple Street	CSOU Screening Level Data	457
1000	A-1420	N/A	30128503308180000	720 W. 7th Street	CSOU Screening Level Data	3,240
1001	A-1421	N/A	30128503215120000	218 W. 3rd	CSOU Screening Level Data	693
1002	A-1423	N/A	30128503329070000	415 Hickory Street	CSOU Screening Level Data	538
1003	A-1424	N/A	30128503303010000	720 Locust	CSOU Screening Level Data	654
1004	A-1429	N/A	30128504112090000	1602 W. Park Street	CSOU Screening Level Data	405
1005	A-1430	N/A	30128504208110000	1701 W. Park Street	CSOU Screening Level Data	601
1006	A-1432	N/A	30128503201100000	821 W. 4th Street	CSOU Screening Level Data	991
1007	A-1433	N/A	30128503314040000	614 Main Street	CSOU Screening Level Data	946
1008	A-1435	N/A	30128503215020000	219 Park Street	CSOU Screening Level Data	4,920
1009	A-1436	N/A	30128503307090000	815 W. 6th Street	CSOU Screening Level Data	450
1010	A-1437	N/A	30128503318150000	503 Pine Street	CSOU Screening Level Data	676
1011	A-1438	N/A	30128503208120000	300 Hickory Street	CSOU Screening Level Data	2,420
1012	A-1439	N/A	30128503202130000	817 W. 3rd Street	CSOU Screening Level Data	839
1013	A-1440	N/A	30128504407060000	1000 W. 4th Street	CSOU Screening Level Data	1,260
1014	A-1441	N/A	30128503304020000	720 Hickory Street	CSOU Screening Level Data	957
1015	A-1441.2	N/A	30128503304010000	210 W. 8th Street	CSOU Screening Level Data	1,020
1016	A-1442	N/A	30128503209070000	803 W. Park Street	CSOU Screening Level Data	575
1017	A-1445	N/A	30128503122060000	105 N. Main Street	CSOU Screening Level Data	953
1018	A-1446	N/A	30128503204120000	609 W. 3rd Street	CSOU Screening Level Data	519
1019	A-1454	N/A	30128503217240000	101 Walnut Street	CSOU Screening Level Data	481
1020	A-1458	N/A	30128503211010000	621 W. Park Street	CSOU Screening Level Data	610

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
1021	A-1459	N/A	30128503220160000	105 Maple Street	CSOU Screening Level Data	541
1022	A-1460	N/A	30128503211050000	609 W. Park Street	CSOU Screening Level Data	972
1023	A-1461	N/A	30128503213040000	415 W. Park Street	CSOU Screening Level Data	589
1024	A-1462	N/A	30128503324110000	621 W. 4th Street	CSOU Screening Level Data	785
1025	A-1463	N/A	30128503319170000	513 Elm Street	CSOU Screening Level Data	498
1026	A-1464	N/A	30128503308020000	622 Walnut	CSOU Screening Level Data	752
1027	A-1465.1	N/A	30128503310190000	623 Pine Street	CSOU Screening Level Data	599
1028	A-1465.2	N/A	30128503310190000	520 W 7th Street	CSOU Screening Level Data	859
1029	A-1466	N/A	30128503312110000	607 Maple Street	CSOU Screening Level Data	743
1030	A-1467	N/A	30128503313150000	617 Locust Street	CSOU Screening Level Data	2,190
1031	A-1468	N/A	30128503303110000	309 W. 7th Street	CSOU Screening Level Data	2,310
1032	A-1470	N/A	30128503304060000	704 Hickory Street	CSOU Screening Level Data	1,960
1033	A-1472	N/A	30128503314070000	600 Main St	CSOU Screening Level Data	542
1034	A-1473	N/A	30128503322130000	523 HICKORY	CSOU Screening Level Data	970
1035	A-1474	N/A	30128503216080000	708 PARK	CSOU Screening Level Data	1,010
1036	A-1477	N/A	30128503127010000	226 Cedar Park Dr.	CSOU Screening Level Data	718
1037	A-1478	N/A	30128503307080000	600 Spruce	CSOU Screening Level Data	828
1038	A-1495	N/A	30128503435110000	721 E 4th Street	CSOU Screening Level Data	770
1039	A-1510	N/A	30128502327140000	1221 Park	CSOU Screening Level Data	768
1040	A-1513	N/A	30128502305100000	1020 E 6th Street	CSOU Screening Level Data	614
1041	A-1770	N/A	30128503308140000	607 Spruce Street	CSOU Screening Level Data	844
1042	A-1771	N/A	30128503314010000	110 W. 7th Street	CSOU Screening Level Data	971
1043	A-1772	N/A	30128503218050000	514 W. Park Avenue	CSOU Screening Level Data	869
1044	A-1775	N/A	30128503305120000	707 Hickory Street	CSOU Screening Level Data	1,110
1045	A-1776	N/A	30128503313050000	604 Hickory Street	CSOU Screening Level Data	1,140
1046	A-1778	N/A	30128503304040000	710 Hickory Street	CSOU Screening Level Data	912
1047	A-1779	N/A	30128503325180000	520 W. 5th Street	CSOU Screening Level Data	502
1048	A-1780	N/A	30128503220040000	310 & 312 W. Park Street	CSOU Screening Level Data	1,920
1049	A-1783	N/A	30128503314020000	622 Main Street	CSOU Screening Level Data	739
1050	A-1784	N/A	30128503204020000	618 W. 4th Street	CSOU Screening Level Data	565

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
1051	A-1786	N/A	30128503317060000	514 Pine Street	CSOU Screening Level Data	695
1052	A-1788	N/A	30128503326070000	404 Maple Street	CSOU Screening Level Data	782
1053	A-1792	N/A	30128503323150000	415 Spruce	CSOU Screening Level Data	636
1054	A-1793	N/A	30128503315040000	514 Spruce	CSOU Screening Level Data	496
1055	A-1794	N/A	30128503328140000	220 W. 5th Street	CSOU Screening Level Data	482
1056	A-1797	N/A	30128503124100000	109 N. Locust Street	CSOU Screening Level Data	758
1057	A-1799	N/A	30128503201010000	810 W. 5th Street	CSOU Screening Level Data	560
1058	A-1802	N/A	30128503204130000	611 W. 3rd Street	CSOU Screening Level Data	748
1059	A-1803	N/A	30128503309030000	618 Pine Street	CSOU Screening Level Data	583
1060	A-1804	N/A	30128503207130000	307 W. 3rd Street	CSOU Screening Level Data	649
1061	A-1808	N/A	30128503314050000	610 Main Street	CSOU Screening Level Data	1,450
1062	A-1809	N/A	30128503220150000	323 W. Commercial	CSOU Screening Level Data	497
1063	A-1810	N/A	30128503207090000	312 Locust Street	CSOU Screening Level Data	897
1064	A-1811	N/A	30128503316130000	517 Spruce Street	CSOU Screening Level Data	517
1065	A-1813	N/A	30128503309120000	619 W. 6th Street	CSOU Screening Level Data	400
1066	A-1814	N/A	30128503203070000	701 W. 3rd	CSOU Screening Level Data	758
1067	A-1816	N/A	30128503328070000	215 W. 4th Street	CSOU Screening Level Data	420
1068	A-1822	N/A	30128503309160000	611 Walnut Street	CSOU Screening Level Data	666
1069	A-1823	N/A	30128503325020000	508 W. 5th Street	CSOU Screening Level Data	755
1070	A-1826	N/A	30128504109040000	212 Willow Street	CSOU Screening Level Data	469
1071	A-1827	N/A	30128503206190000	419 W. 3rd Street	CSOU Screening Level Data	660
1072	A-1828	N/A	30128503204100000	304 Pine Street	CSOU Screening Level Data	789
1073	A-1830	N/A	30128503323070000	701 W. 4th Street	CSOU Screening Level Data	520
1074	B-100	N/A	30128502319020000	1202 E. 4th Street	CSOU Screening Level Data	783
1075	J-31-A	N/A	N/A	J 31 Alley	CSOU Screening Level Data	508
1076	K-31-A	N/A	N/A	K 31 Alley	CSOU Screening Level Data	458
1077	L-38-A	N/A	N/A	L 38 Alley	CSOU Screening Level Data	465
1078	M-30-A	N/A	N/A	M 30 Alley	CSOU Screening Level Data	482
1079	M-33-A	N/A	N/A	M 33 Alley	CSOU Screening Level Data	426
1080	P-38-A	N/A	N/A	P 38 Alley	CSOU Screening Level Data	N/A[1]

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
1081	N/A	OC-0001	30128611303010000	214 N. Schuyler St.	Enforcement Level Data	513
1082	N/A	OC-0009	30128610402070000	1105 Stewart St	Enforcement Level Data	437
1083	N/A	OC-0060	30128610303250000	700 Rickards	Enforcement Level Data	1,210
1084	N/A	OC-0093	30128610304030000	166 N Preston St	Enforcement Level Data	1,030
1085	N/A	OC-0095	30128615101230000	107 S Hauser St	Enforcement Level Data	622
1086	OP-005	N/A	30128615401050000	500 S. Sidney	CSOU Screening Level Data	471
1087	OP-008	N/A	30128610303120000	703 Stewart	CSOU Screening Level Data	434
1088	OP-021	OC-0083	30128615205040000	116 South Hauser St	Enforcement Level Data	875
1089	OP-023	OC-0085	30128615102020000	1006 E. Stewart St	Enforcement Level Data	665
1090	OP-026	OC-0086	30128615101270000	19 South Hauser St	Enforcement Level Data	492
1091	OP-028	N/A	30128616101090000	210 Stewart	CSOU Screening Level Data	470
1092	OP-049	N/A	30128615205020000	104 S. Hauser	CSOU Screening Level Data	601
1093	OP-058	OC-0016	30128615204190000	6 S Hauser	Enforcement Level Data	858
1094	OP-059	OC-0012	30128610303050000	8 N Hauser ST	Enforcement Level Data	790
1095	OP-060	OC-0014B	30128615204180000	808 W Stewart St	Enforcement Level Data	504
1096	OP-065	N/A	30128614203030000	1508 Stewart	CSOU Screening Level Data	480
1097	OP-071	N/A	30128610303010000	806 Rickards	CSOU Screening Level Data	416
1098	OP-073	OC-0051	30128609402110000	103 W. Stewart	Enforcement Level Data	577
1099	OP-076	N/A	30128616101080000	110 Stewart Street	CSOU Screening Level Data	3,420
1100	OP-080	OC-0018	30128615101150000	1019 Crosby St	Enforcement Level Data	423
1101	OP-089	OC-0029	30128615204110000	710 Stewart St	Enforcement Level Data	450
1102	R-037	N/A	30137723201040000	3100 Lost Creek Road	CSOU Screening Level Data	447
1103	R-043	N/A	30137723201150000	Lost Creek Road	CSOU Screening Level Data	543
1104	R-090	N/A	30128522301020000	505 Bear Paw Trail	CSOU Screening Level Data	457
1105	R-090.1	N/A	30128522301020000	505 Bear Paw Trail	CSOU Screening Level Data	759
1106	R-091	N/A	30128522301050000	1100 Bear Paw Trail	CSOU Screening Level Data	576
1107	R-101	N/A	30128520401040000	255 Wapiti Trail 59711	CSOU Screening Level Data	408
1108	R-124	OC-0076	30128626302110000	100 Mulcahy Road	Enforcement Level Data	473
1109	R-128	N/A	30128626302100000	241 WALTER DRIVE	CSOU Screening Level Data	404
1110	R-150	N/A	30128636101010000	4600 Crackerville Road	CSOU Screening Level Data	728

COMMUNITY SOILS OPERABLE UNIT
LIST OF PROPERTIES WITHIN THE CS OU WITH SCREENING LEVEL AND
ENFORCEMENT LEVEL (OPPORTUNITY) LEAD CONCENTRATIONS IN SOIL >/= 400 PPM LEAD

Count	RES_ID	2012OPP_ID	GEOCODE	ADDRESS	DATA_TYPE	MaxOfPbCmpntConc
1111	R-151	N/A	30128636102020001	4507 Crackerville Road	CSOU Screening Level Data	1,240
1112	R-152	N/A	30128636102020001	4507 Crackerville Road	CSOU Screening Level Data	1,220
1113	R-153	N/A	30128636102040000	4509 Crackerville Road	CSOU Screening Level Data	444
1114	R-154	N/A	30128636102050000	1008 Bossard Road	CSOU Screening Level Data	1,580
1115	R-155	N/A	30128636102070000	4813 Crackerville Road	CSOU Screening Level Data	1,730
1116	R-156	N/A	30128636102080001	4917 Crackerville Rd.	CSOU Screening Level Data	603
1117	R-157	N/A	30128615302010000	(NO ADDRESS)	CSOU Screening Level Data	674
1118	R-161	N/A	30128622302040000	1564 Crackerville Road	CSOU Screening Level Data	449
1119	R-162.1	N/A	30128616301010001	700 Willow Glen Road	CSOU Screening Level Data	801
1120	R-162.2	N/A	30128616301010001	700 Willow Glen Road	CSOU Screening Level Data	2,940
1121	R-164	N/A	30137831101040000	1009 Galen Road	CSOU Screening Level Data	883
1122	R-179	N/A	30128523401040000	Aspen Hills	CSOU Screening Level Data	447
1123	R-182	N/A	30128527101030000	471 Bear Paw Trail 59711	CSOU Screening Level Data	409
1124	R-200	N/A	30137806401040000	1618 Spring Gulch	CSOU Screening Level Data	598
1125	R-240	OC-0074	30128626304010000	3332 Crackerville Road	Enforcement Level Data	403
1126	R-246.10	N/A	30148231201010000	Galen Campus	CSOU Screening Level Data	564
1127	R-246.6	N/A	30148231201010000	Galen Campus	CSOU Screening Level Data	718
1128	R-272.1	N/A	30128526201020000	6335 Aspen Hills Trail	CSOU Screening Level Data	485
1129	R-289	N/A	30137817101010000	Need Address	CSOU Screening Level Data	467
1130	R-812	N/A	30128636201020000	4440 Crackerville Road	CSOU Screening Level Data	411

[1] -- Couldn't find archived P-38-A alley sample in July 2015 when analyzing for lead values. Therefore, added this alley to the table for future sampling.

APPENDIX B

RESIDENTIAL SOILS/DUST
CONSTRUCTION QUALITY ASSURANCE PLAN (CQAP)

ANACONDA SMELTER NPL SITE
COMMUNITY SOILS OPERABLE UNIT

Final

Residential Soils/Dust
Construction Quality Assurance Plan (CQAP)

Atlantic Richfield Company

August 7, 2015

ANACONDA SMELTER NPL SITE
COMMUNITY SOILS OPERABLE UNIT

Final

Residential Soils/Dust
Construction Quality Assurance Plan (CQAP)

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

Pioneer Technical Services, Inc.
P. O. Box 3445
Butte, Montana 59702

August 7, 2015

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REVISION SUMMARY

Revision No.	Author	Version	Description	Date
Rev 0	Jesse Schwarzrock	Draft	Issued for Atlantic Richfield Review	April 1, 2015
Rev 1	Jesse Schwarzrock	Draft Final	Issued for Agency Review	May 1, 2015
Rev 2	Jesse Schwarzrock	Final	Issued for Agency Review	August 7, 2015

1.0 INTRODUCTION

In 1996, the U.S. Environmental Protection Agency (EPA) and the Montana Department of Environmental Quality (DEQ), together commonly referred to as the Agencies, issued the *Community Soils (CS) Operable Unit (OU) Record of Decision* (ROD) (EPA, 1996) for remediation of the Community Soils Operable Unit (CS OU) of the Anaconda Smelter National Priorities List (NPL) Site. In 1997, Atlantic Richfield Company, a Potentially Responsible Party (PRP), and the Agencies entered into the *11th Amendment to Administrative Order on Consent (AOC), Comprehensive Environmental Response*, Compensation, and Liability Act (CERCLA), Docket No. CERCLA-VIII-*88-16* (EPA, 1997) for the remedial design (RD) of the CS OU. This amendment to the AOC specified completion of a work plan that describes the RD/Remedial Action (RA) for the CS OU. In 2002, the *Final Community Soils Operable Unit Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* (Atlantic Richfield Company, 2002) was developed to identify and describe RD/RA for the site, due to arsenic in soils. In 2013, the Agencies issued the CS OU ROD Amendment (EPA/DEQ, 2013) for additional remediation of the CS OU of the Anaconda Smelter NPL Site. The CS OU ROD Amendment (EPA/DEQ, 2013) added a lead action level for residential soils (in additional to the pre-existing arsenic action level) as well as lead and arsenic action levels for attic dust. This Construction Quality Assurance Plan (CQAP) describes construction quality assurance (QA) procedures and responsibilities applicable to RA work performed under this Remedial Action Work Plan/Final Design Report (RAWP/FDR).

1.1 Purpose and Objectives

Construction quality control (QC) will be the responsibility of the RA construction Contractor. The RAWP/FDR for the project outlines the QC requirements that the construction Contractor is expected to fulfill. Atlantic Richfield Company has the responsibility to implement and maintain a QA program as a means of verifying the Contractor's QC procedures. The main purpose of this CQAP is to describe QA procedures for confirming that CS OU RA meets the performance standards presented in this RAWP/FDR. The specific objectives of the CQAP include:

- Defining the QA team organization and responsibilities.
- Defining the interaction between the QA program and the RA Contractor's QC plan.
- Describing project communication, documentation, and record keeping protocols, on-site communications, progress meetings, and preparation of progress reports and construction files.
- Detailing the role of the QA team in reviewing and approving certifications and submittals; in conducting verification testing, sampling, and analyses; and in monitoring during RA construction activities. These QA efforts are in addition to the testing and analyses applicable to the Contractor's QC program.
- Defining independent testing to be conducted by the QA team.

1.2 Site Location and Description

The following is a description of the Anaconda Smelter NPL Site and the CS OU as provided in the CS OU ROD (EPA, 1996):

"The Anaconda Smelter National Priorities List (NPL) Site is located in the Deer Lodge Valley in southwestern Montana, in and around the city of Anaconda and about 25 miles northwest of the city of Butte. Milling and smelting activities conducted at the Old Works and Washoe Reduction Works smelters for nearly 100 years have resulted in the contamination of various environmental media in the surrounding area, primarily through airborne emissions and disposal practices from smelting operations.

The Anaconda Smelter NPL Site has been divided into several operable units (OUs), two of which have not been completed: the Community Soils OU and the Anaconda Regional Water, Waste, and Soils (ARWWS) OU. The study area for the Community Soils OU, as well as the ARWWS OU, covers approximately 300 geographic sections (1-square mile each) and includes the communities of Anaconda, Opportunity, Fairmont, Galen, and Warm Springs. The Community Soils OU, for which this Record of Decision (ROD) has been prepared, addresses all residential and commercial/industrial soils throughout the NPL Site. The Community Soils OU Remedial Investigation/Feasibility Study (RI/FS) characterizes residential and commercial/industrial soils and railroad beds, and provides a procedural means to identify and evaluate alternatives that remedy human health risks in residential and commercial/industrial areas within the site.

The Community Soils area of concern is generally bounded on the east and south by the border of Deer Lodge and Silver Bow Counties, on the west by the Anaconda West Valley, and on the north by the border of Deer Lodge and Powell Counties. The majority of this land is classified as rural. The Community Soils OU consists of the five communities within this area, and all other residential areas within the Anaconda Smelter NPL Site. The five communities included in the study area have a combined population of under 8,600 (Peccia & Associates 1992).

Prior to closure of smelter operations in 1980, the Anaconda Smelter was a source of substantial air emissions at the site. The distance and direction of each of the five communities from the stack located on Smelter Hill are: Anaconda, less than one mile northwest; Opportunity, 3.0 miles east; Fairmont, 6.8 miles southeast; Warm Springs, 7 miles northeast; and Galen, 10.4 miles northeast. Other sources of aerial contaminants related to the Anaconda milling and smelting operations have also contributed to community soils contamination."

The following is a description of the expanded area of concern as provided in the CS OU ROD Amendment (EPA/DEQ, 2013):

"For this amendment, the EPA considers the area of concern for lead contaminated soils and interior dust to be the Anaconda-Deer Lodge County Superfund Planning District. The Superfund Planning District boundary is shown in Appendix A. The EPA is eliminating the need to define a Focus Area, as all previously sampled residences under the arsenic residential soils

remedial action will be addressed under this action. All residences with unremeditated yard components exceeding the 400 mg/kg cleanup level will be addressed, with prioritization given to yards where the existing data indicate the surficial soils are present that exceed the 400 mg/kg lead cleanup level. All other residences in Anaconda and within ADLC's Superfund Planning District boundary will continue to be sampled on an opportunistic basis (e.g. sampling by request)."

2.0 QA ORGANIZATION AND RESPONSIBILITIES

2.1 QA Organization

Atlantic Richfield Company will be responsible for implementing and maintaining construction QA activities. Contractors for Atlantic Richfield Company (hereafter referenced as the "QA Team") will be tasked with performing the QA activities. The QA Team will be comprised of engineers, scientists, and technicians qualified and experienced in work similar to the CS OU RA. Specific personnel assignments will be established prior to initiating the RA construction activities. A QA Team Leader will be identified as the main point of contact for the QA Team. The QA Team will conduct both office and fieldwork activities to verify that the RA construction work is completed as specified. Laboratory analyses and testing will be performed by an Atlantic Richfield Laboratory Management Program (LaMP) certified laboratory. Figure 1 shows the organization of the QA Team applicable to the CS OU RA work.

2.2 QA Responsibilities

The following sections of this plan detail the responsibilities of the QA Team. In general, the QA Team will be responsible for the following during the RA construction activities:

- Planning and implementing QA reporting, record keeping, progress meetings, and inspections;
- Reviewing and approving materials certifications and other submittals;
- Conducting field sampling, and materials analyses;
- Verifying the quality of all construction activities to assure compliance with the design criteria;
- Verifying excavation depth (compliance with design depth and associated tolerances);
- Verifying cover soil quality and application thicknesses;
- Verifying proper sod installation procedures;
- Verifying embankment and surface aggregate application thicknesses and compaction; and
- Verifying QA/QC Standard Operating Procedures (SOPs) are followed as outlined in the CS OU SOPs.

3.0 PROJECT COMMUNICATION

3.1 Reporting

Atlantic Richfield Company will be responsible for submitting a Monthly Progress Report to the Agencies on or before the 10^{th} day of every month. These reports will present summaries of the important information relating to the monthly RA construction activities gathered from the various records described in Section 3.2. The Monthly Progress Report will include, if necessary, any proposed or field-approved modifications (and justifications) to the RAWP/FDR, this CQAP, the Drawings, the Technical Specifications, or the Site-Specific Health and Safety Plan (SSHASP). The QA Team Leader will obtain updated information from the construction Contractor regarding construction activities, including percent completion and any scheduling modifications. The Monthly Progress Report will summarize the construction progress information.

3.2 Record Keeping

Members of the QA Team will perform various record keeping duties under the supervision of the QA Team Leader. The QA Team is responsible for maintaining a complete and accurate record of all significant observations and inspections and documenting all field and laboratory testing. These records will be maintained by the Engineer to allow review by the Atlantic Richfield Company and Agency personnel. All record keeping will be completed in accordance with the methods and procedures specified in the CS OU Field SOPs located in Appendix E, Attachment A-1. The record keeping responsibilities of the QA Team will include the following:

- Daily Project Logs – A member of the QA Team will complete a daily project log describing all field activities. Log entries will document all significant activities including any abnormal observations, weather conditions, deviations from the Drawings or the Technical Specifications or other standard procedures, health and safety meetings, important information and summaries regarding field sampling, measurements, observations or testing, equipment calibration results (as necessary), any photographs taken and topics/results of any significant meetings or discussions.

- Photographs – Construction photographs and associated logs will be recorded on a periodic basis to visually document significant construction activities and to provide visual reference material.

- Photographs of residential yards and attics prior to and following construction activities.

- QA Testing Documents – Instrument calibration/standardization forms (if any), field and laboratory measurement and sampling forms, sample logs, documentation forms, sample analyses requests, chain of custody forms, and any other documents related to QA testing will be kept by the QA Team Leader and at Atlantic Richfield Company's office.

- Other Documentation – Other documentation includes, but is not limited to, materials compliance certifications, Material Safety Data Sheets (MSDSs), health and safety and construction meeting summaries, inspection records, relevant construction files, material samples and manufacturer's recommended installation or operating instructions.

3.3 Construction Inspections and Meetings

A series of meetings and inspections will be conducted while implementing each phase of the RA work. The meetings and inspections mentioned in this section are in addition to the daily construction oversight inspections to be conducted by the QA Team. The following are inspections and meetings anticipated for each phase of RA construction:

- Pre-construction Meeting – Atlantic Richfield Company will initiate and conduct a pre-construction meeting with the RA Contractor, Agency personnel, and other involved parties prior to the start of each RA construction season. The goal of this meeting includes familiarizing all parties with the requirements of the project; safety concerns and hazards, relevant access and logistical issues, and verifying that the design criteria specified in the RAWP/FDR, the Drawings, and Technical Specifications are understood.

- Weekly Progress Meetings – Weekly progress meetings will be conducted during construction to inform all parties of scheduling changes, overall RA implementation progress and any other relevant construction issues, as necessary. Weekly progress meetings will be scheduled for a common day and time that is mutually agreed upon by all parties involved. Weekly progress meetings may be changed to a less frequent schedule if construction activities become routine and weekly meetings are not warranted.

3.4 Final QA Construction Monitoring Report

Upon completion of the construction phase of the RA, a QA summary containing the results of the construction monitoring and testing will be included in the annual Construction Completion Report (CCR). The summary will be comprehensive and will contain a description of all QA activities, a summary of the results, significant events, and supporting data. The summary will not include the daily construction logs; however, significant or relevant portions of the logs may be used or referenced.

4.0 CONSTRUCTION QA ACTIVITIES

4.1 Materials Certification

It is imperative that the correct materials are used during RA construction to maintain the functionality of the design. It will be the responsibility of the QA Team to review and approve all certifications required as specified in the project Technical Specifications. Table 1 lists the materials anticipated for certification submittal and review. Table 1 may change, if necessary.

4.2 Construction Staking and Verification

The QA Team will be responsible for all construction area staking prior to the RA work. The following sections of this plan describe the anticipated features of the RA, which will need to be staked for excavation depth and alignment. Due to the anticipated small areas involved with this RA work (i.e., residential yards, boulevards, gardens, gravel driveways, etc.), staking will most likely consist of measuring specific residential yard components using a hand tape and using existing features (i.e., fences, foundations, concrete sidewalks, concrete driveways, etc.) to define excavation boundaries.

4.2.1 Residential Yards

As deemed necessary by the QA Team, individual residential yard components (i.e., boulevards, gardens, gravel driveways, etc.) and alleys to be excavated and backfilled may be staked to indicate the excavation depth(s) (2 inches, 6 inches, or 12 inches) and associated lateral excavation boundaries. Due to small areas involved with this RA work, excavation staking will not always be necessary.

The location of each yard component associated with the RA can be determined using occupation markers (installed by the QA Team) in conjunction with the scaled maps (Individual Site Work Plans [ISWPs]) generated for each residence involved with the RA. Due to the relatively small areas involved (i.e., residential yards, boulevards, gardens, gravel driveways, etc.), delineation of yard components may consist of measuring using a hand tape and using existing features (i.e., fences, foundations, concrete sidewalks, concrete driveways, etc.) to define excavation boundaries. Otherwise, excavation boundaries may be delineated using resource grade global positioning system (GPS).

4.2.1.1 Excavation Depth Verification

Due to the relatively small areas involved (i.e., residential yards, boulevards, gardens, gravel driveways, etc.), depth verification of yard component excavation may consist of measuring using a hand tape and existing perimeter features (i.e., fences, foundations, concrete sidewalks, concrete driveways, etc.) to define excavation boundaries. As needed, the QA Team will complete stake island measurements throughout the course of the work to verify that excavation depths are in agreement with the specified tolerances. Acceptable depth tolerance for excavations will be the specified depth (6 or 12 inches) +0.1 foot or -0.0 foot, measured from below the existing ground surface or below existing sod or aggregate layers, as applicable.

4.2.1.2 Backfill Placement

Areas to receive general backfill will be defined by the limits of excavation. In general, backfill will be placed to a depth corresponding to the surrounding ground surface. The upper most lift of backfill in lawn areas (i.e., within 6 inches of the final grade surface) will not be compacted to attain a specific density and moisture content, but will be rolled and slightly compacted using small, hand-operated equipment to achieve a smooth surface that matches the surrounding topography. Driveways, walkways, and alleys will be compacted using appropriate compaction equipment to attain moisture and density specifications as indicated in the Technical Specifications. The bottom 6 inches of backfill in lawn areas excavated to a total depth of 12 inches, driveway, walkways, and alleys will be compacted using specified compaction equipment indicated in the Technical Specifications. The surface of backfilled areas will be prepared in such a manner that they are amenable to sod placement or aggregate placement (i.e., smooth, not overly steep, no abrupt edges, etc.).

4.2.1.3 Sod Placement

The QA Team will ensure that all sod is placed in accordance with the Standard Drawings (Appendix D) and the project Technical Specifications (Appendix C).

4.2.1.4 Aggregate Placement

Aggregate materials may be placed over backfilled driveways, walkways, alleys, and possibly in boulevards.   Areas to receive aggregate surface materials will be identified on an ISWP indicating the aggregate placement boundary and depth.

4.2.1.5 Seeding

Some residential yards may be seeded as opposed to receiving sod application. Additionally, some residential areas may not be classified as “yards” and may receive an “uplands” seed mix. Areas to be seeded will be identified on the ISWP. Seeding will be monitored to ensure compliance with Technical Specifications (i.e., seed and fertilizer mixes and application rates, etc.). The seedbed will be inspected to verify that it is suitable for planting. This inspection will include verification that the soil is not overly compacted.

Revegetation equipment will be inspected to verify that the equipment is adequate for the job and has been properly calibrated to apply seed mixes, fertilizer and mulch at the application rates stated in the Technical Specifications. The Contractor must supply certified mixtures for all areas. The QA/QC Engineer will check the seed and fertilizer container labels for product verifications and will keep a record of relevant information. The QA/QC Engineer will also verify that mulch consists of either grass hay or straw free of noxious weeds. Tilling or crimping will be performed perpendicular to the flow-line of the slope.

4.3 Testing, Sampling, and Analyses

4.3.1 Cover Soil Borrow Material Sampling and Analysis

The primary cover soil borrow source to be used during this RA project has yet to be determined. When a suitable cover soil borrow source is selected, it will be submitted to the Agencies for review and approval. At a minimum, cover soil material will meet the cover soil suitability criteria detailed in Table 2. This material will only be used as the upper 6 inches of backfill in areas designated to receive sod application. General backfill applied in areas excavated deeper than 6 inches (i.e., 6 to 12-inch depth) will be obtained from other Agency-approved borrow source(s).

As determined necessary by the QA/QC Engineer and the Agencies field representatives, cover soil borrow material will be screened to achieve a final product that passes through a 1-inch minus screen. All cover soil borrow material will be Agency approved in the field on a "per stockpile" basis prior to use.

Samples will be collected from a suitable soil stockpile with a backhoe or front-end loader at the frequency specified in Section 4.3.1.1. Analyses of samples collected from the stockpile will be compared to previous stockpile sample analyses, when determining median values for texture and rock content. Median values will be used to evaluate overall acceptability of the borrow area but individual sample results will be used to manage the borrow operations.
All sampling and documentation procedures will be performed as specified herein.

4.3.1.1 Cover Soil Borrow Material Sampling Frequency

Samples will be collected and analyzed for texture, rock content, saturation percentage, pH, electrical conductivity, sodium adsorption ration, and total metals (as detailed in Table 2) approximately once every 500 cubic yards hauled. Samples may be collected more or less frequently based on the QA/QC Engineer and Agencies field representatives judgment whenever the borrow material changes in appearance or if the apparent rock content of material significantly changes. If the rock content or texture criteria are not being met, excavation operations will be moved to another section of the borrow area until the criteria can be met by removing unacceptable material or changing borrow operations, as approved by the QA/QC Engineer and the Agencies.

4.3.2 Aggregate Materials Sampling and Analysis

Conformance testing of the specified aggregate material(s) to be installed on driveways and walkways will be conducted by the Contractor to assure the consistency of the aggregate material properties obtained from the aggregate source. At a minimum, the particle size distribution of the aggregate material(s) will be tested in accordance with American Society of Testing and Materials (ASTM) C 136 least once prior to initiating the construction phase of the project.

4.3.3 Compaction Testing

The following components of the RA will require compaction verification by the QA Team:

- In yard/lawn areas that involve removal to a depth of 12 inches, the bottom 6 inches of the backfilled soil is subject to qualitative compaction specifications;
- General backfill replaced in excavated driveways, walkways, and certain paddock areas; and
- Aggregate surface course placed on driveways, walkways, and certain paddock areas.

Due to the relatively shallow depths of embankments involved with this project in conjunctions with lessons learned from previous RA activities, all compaction specifications for this project are qualitative in nature (i.e., quantitative compaction verification using a moisture – density gauge is not necessary). The QA Team will verify that the minimum number of passes is completed using specified equipment in areas subject to qualitative compaction specifications, and will ensure that all subgrades and embankments are reasonably firm and unyielding considering the intended use of the final product.

4.4 Attic Dust Confirmation Sampling

Following cleanup of an attic, confirmation sampling will be performed within the attic in accordance with the *Lead Dust Sampling Technician Field Guide, EPA-W-04-022* (EPA, 2009) located in Exhibit A. Confirmation sampling will consist of wiping the encapsulation material on the attic floor following encapsulation material placement. If confirmation sampling provides a lead result greater than or equal to 40 micrograms per square foot ($\mu g/ft^2$), encapsulation material will be re-applied, followed by another round of confirmation sampling. All confirmation wipe samples will be placed in a ziplock bag and delivered to an Atlantic Richfield LaMP certified laboratory, to be analyzed for lead. The following steps will be used during confirmation sampling:

1. Sampler will don disposable boot covers and layout the confirmation sampling area. The sampling area will be designated using a clean template or tape. The sampling area will be as close to square, in shape, as possible.

2. Sampler will prepare the sample container/tube by recording the sample identification code on a clean tube, field logbook, sample form, and chain of custody form.

3. Sampler will don a clean/new set of disposable sampling gloves, being careful not to touch anything except the sampling wipe.

4. Sampler will wipe the sample area and place the wipe in the labeled sample tube. To begin sampling, press the wipe down firmly in one of the upper corners of the sample area. Making an "S" motion wipe the entire sample area moving from side to side. Fold the wipe in half making sure to fold the used side in. Starting in the same corner wipe the entire sample area in a forward and back motion. Fold the wipe again. Wipe the area a third time focusing on the corners and edges of the sample area. Fold the sample side of the wipe in again a third time and place the wipe into the labeled sample tube. Seal the container and discard the disposable gloves.

5. Sampler will measure the width and length of the sample area (unless a template of known area is used) to the nearest 1/8 inch. Record the dimensions of the sample area on the sample container and the sample form.

6. Using the sample area measurements, sampler will calculate the sample surface area and record in the field logbook as well as on the sample collection form and chain of custody form.

7. If a template was used, sampler will clean it with a clean wipe and place the template in a plastic bag for storage.

8. Sampler will ship samples to a laboratory recognized by the National Lead Laboratory Accreditation Program (NLLAP) as being proficient in lead dust analysis. All CS OU attic dust confirmation samples will be delivered to an Atlantic Richfield LaMP certified laboratory, to be analyzed for lead.

Following confirmation sampling and verification that the lead dust level is below 40 $\mu g/ft^2$, the residential property sampled will be updated in the CS OU database as RA Complete for attic dust.

5.0 ENVIRONMENTAL MONITORING

5.1 Water Quality Monitoring

No surface water or groundwater monitoring is currently planned during the RA for the Residential Soils portion of the CS OU. There are no perennial surface water bodies in close proximity to possible work areas that would potentially be impacted by the RA. Additionally, since the excavation activities do not include excavating any areas to a depth greater than 24 inches below the ground surface, groundwater is not expected to be encountered nor impacted by the RA activities.

The contaminated materials generated by this RA will be disposed in an Agency-approved waste management area (WMA) within the Anaconda Smelter NPL Site. Routine groundwater and surface water monitoring programs are already in place at this WMA.

5.2 Dust Control

Fugitive dust emissions will be controlled during all RA operations to comply with the site performance standards specified in the CS OU ROD (EPA, 1996) and the CS OU ROD Amendment (EPA/DEQ, 2013). If air emissions from the RA operations are excessive, operations will be modified and/or dust control measures will be implemented to achieve compliance within limits. Dust control measures may include applying water directly to the removal/replacement areas; haul roads or other disturbed areas; wetting or tarping loaded haul trucks; speed reduction; construction of wind breaks around excavation areas; or requiring work activity modifications or shutdown. A final decision regarding what, if any, dust control measures are required will be made by Atlantic Richfield Company and the Agency field personnel. If handling methods are the cause of excessive airborne emissions, then modifications to the handling methods will be instituted.

6.0 REFERENCES

Atlantic Richfield Company, 2002. Anaconda Smelter NPL Site, Community Soils Operable Unit, Final Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR). July 2002.

EPA, 2009. Lead Dust Sampling Technician Field Guide, EPA-W-04-022. May 2009.

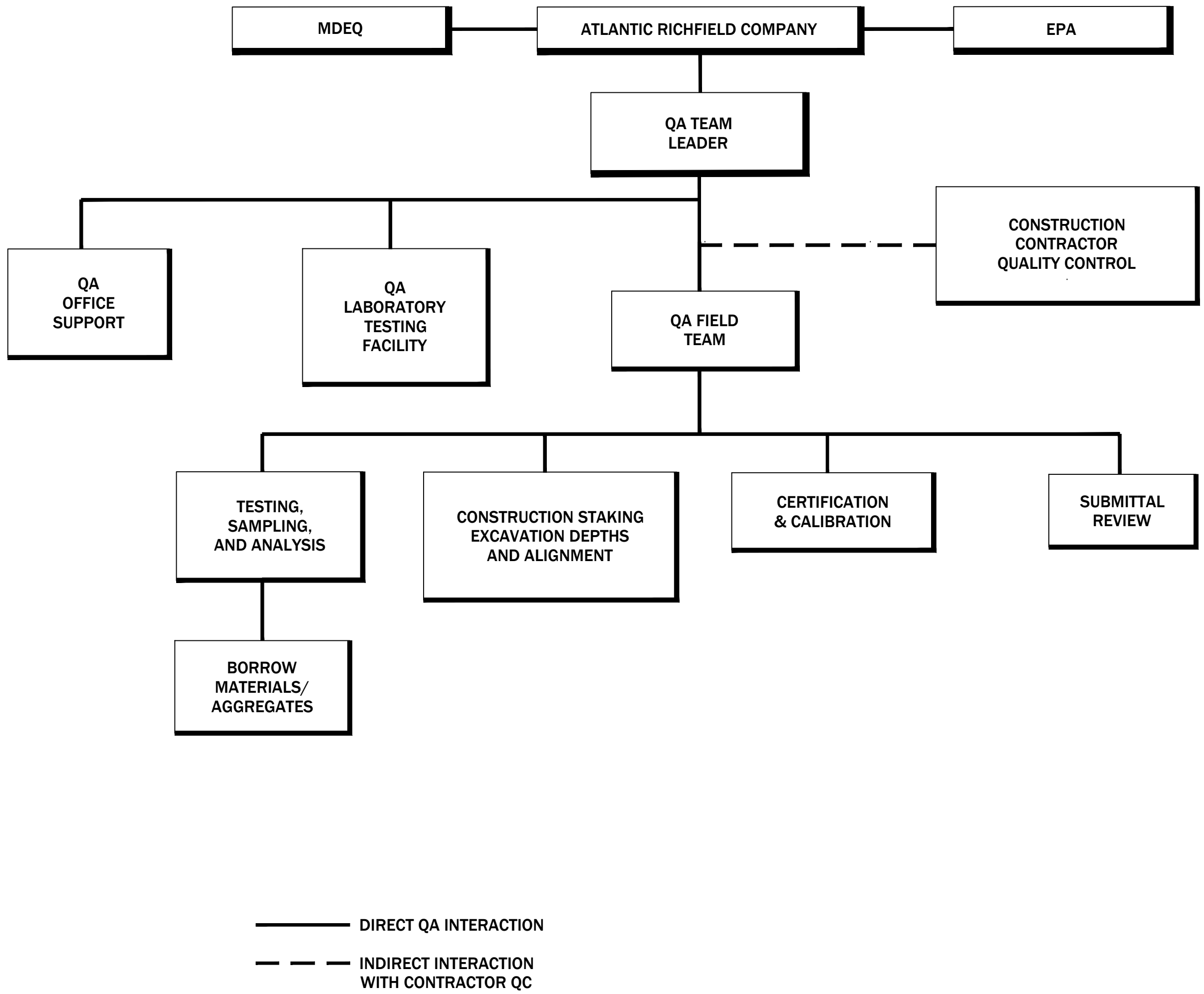
EPA, 1997. Amendment to Administrative Order on Consent (AOC), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Docket No. CERCLA-VIII-88-16, Community Soils Operable Unit, Anaconda Smelter NPL Site, Anaconda, Montana, 1997.

EPA, 1996. Record of Decision, Community Soils Operable Unit, Anaconda Smelter NPL Site, Anaconda, Montana. September 1996.

EPA/DEQ, 2013. Record of Decision Amendment, Community Soils Operable Unit, Anaconda Smelter National Priorities List Site, Anaconda, Montana. September 2013.

FIGURES

COMMUNITY SOILS OPERABLE UNIT
QUALITY ASSURANCE ORGANIZATION



DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:

SCALE IN FEET
0 NA

FIGURE 1

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MT 59711
(406) 563-9371

QUALITY ASSURANCE ORGANIZATION
COMMUNITY SOILS OU
REMEDIAL ACTION

DATE: 4/20/2015

4/20/2015 3:17:34 PM \\192.168.252.15\PROJECT$\ANADATA\AR\CSOU\2015\DOCUMENTS\DRAFT FINAL CS OU FDR (TO EPA 4-XX-15)\APPENDIX B – CQAP\CQAP FIGURES\FIGURE 1.DWG

TABLES

TABLE 1: MATERIAL CERTIFICATION REQUIREMENTS

MATERIAL/EQUIPMENT	SPECIFIC CERTIFICATIONS REQUIRED	
Aggregates	General Crushed Top Surfacing Material	Decorative Top Surfacing Material
Fence	Fence Posts	Fence Panels
Revegetation	Seed Sod	Fertilizer Mulch

TABLE 2: COVER SOIL SUITABILITY CRITERIA (TYPE A MATERIAL)

PARAMETERS	CRITERIA
Texture	(Cannot be sand, clay or loamy sand)
Rock Fragments	<45% by volume in the bank, 6-inch maximum rock diameter
Saturation Percentage	>25% and <85%
pH	>6.5 and <8.5 standard units
Electrical Conductivity	<4,000 umhos/cm with standard seed mix <6,000 umhos/cm for salt tolerant
Sodium Adsorption Ratio	<12 for root zone materials <20 for general fill
Total Elemental Concentration	
Arsenic	<100 mg/kg and approach 30 mg/kg
Cadmium	<4 mg/kg
Copper	<100 mg/kg
Lead	<100 mg/kg
Zinc	<250 mg/kg
Organic Matter	Minimum 1.5% (existing or added as determined by Walkley Black)

μmhos/cm = micromhos per centimeter
mg/kg = milligrams per kilogram

EXHIBIT A

LEAD DUST SAMPLING TECHNICIAN FIELD GUIDE

What Is the Field Guide?

This guide will help determine that a recently-renovated area has been cleaned sufficiently. The Lead Dust Sampling Technician Field Guide should be used by lead dust sampling technicians. The guide provides protocols for conducting post-renovation clearance under EPA's Renovation, Repair, and Painting Rule (RRP) covering housing and child-occupied facilities built before 1978, and clearance examinations under HUD's Lead Safe Housing Rule (LSHR) in federally-assisted housing built before 1978. This guide also provides federal standards for maximum allowable contamination levels of residual lead dust.

How To Use This Guide

Take this guide with you on site when you perform clearance, including visual inspections. It serves as a quick reminder of:

- When and where to take lead dust clearance samples;
- The step-by-step instructions for taking a dust wipe sample; and
- EPA/HUD clearance standards for lead dust.

When To Perform Lead Dust Clearance Tests

Renovation activities that disturb lead-based paint can create lead dust so proper cleanup after these jobs is critical. The purpose of lead dust clearance is to determine if the area is safe for re-occupancy.

Lead dust clearance is performed:

- After renovation, repair, painting, and cleaning activities are finished in property built before 1978 and where children are assumed to spend time.
- After hazard reduction or maintenance activities in most federally-assisted properties built before 1978 that are covered by HUD's LSHR.

Lead dust sampling technicians should NEVER perform post-abatement clearance. (Abatement—as opposed to renovation, repair and painting—is a term used for the complete removal of lead.) When performing clearance, the lead dust sampling technician is required to bring a copy of his or her certificate of initial training to the worksite.

Where To Collect Samples for Lead Dust Clearance Tests

If there is more than one room, hallway, or stairwell within the work area, take:

- One windowsill sample and one floor sample within each room, hall way, or stairwell (no more than four rooms, hallways, or stairwells need be sampled).
- If the windows were not closed and covered with plastic during the renovation, also take one window trough sample in each room, hall way, or stairwell (no more than four need be sampled).
- One floor sample adjacent to the work area, but not in an area that has been cleaned.

For federally-assisted housing, take these samples if the work area is contained, otherwise, clear the whole unit.

If the work area is a single room, hallway, or stairwell, or a smaller area, take:

- One windowsill sample and one floor sample.
- If the windows were not closed and covered with plastic during the renovation, also take one window trough sample.
- One floor sample adjacent to the work area, but not in an area that hasbeen cleaned.

Equipment List

- Disposable lead dust wipes (individually wrapped)
- Disposable gloves
- Disposable shoe covers
- Sample tubes with caps
- Re-usable templates
- Masking or painter's tape
- Ruler
- Sample collection forms
- Chain-of-custody forms
- Markers, trash bags, labels, pens, re-sealable storage bags
- Calculator
- Sanitary wipes

Check with your laboratory for their sampling requirements

Visual Inspections

Lead dust clearance testing for both EPA's RRP Rule and HUD's LSHR requires a visual inspection as a first step in the clearance process:

- Under both HUD and EPA rules, the visual inspection is designed to determine if the area is free of visible dust and debris before lead dust clearance testing can begin.

In addition, under HUD's rule the visual inspection determines whether the unit/work area (interior and exterior) is clear of visible conditions that can result in exposure to lead-based paint hazards:

- Deteriorated paint
- Chips or debris
- Visible dust

Lead Dust Wipe Sampling

Single or composite samples can be taken; however, single-surface sampling is recommended to get results for specific surfaces. Use durable, re-usable 12" x 12" sampling templates, a disposable template, or use tape to lay out the sampling area.

Step One: Put on disposable shoe covers and lay out the sample area

- Clean template with a new wipe.
- Tape template to surface.
- If no template, outline with tape.
- Using tape to lay out the sample area, make sure that on floors the tape is laid in a square. On sills and troughs, the tape should be laid perpendicular to the sill.
- DO NOT touch the area inside the template.

Note: Use disposable shoe covers when walking between buildings and remove shoe covers before entering your vehicle to help minimize the spreading of settled lead dust from one location to another.

Step Two: Prepare the sample tubes

- Use clean tubes.
- Label tube with ID number.
- Record ID number on sample collection form and chain-of-custody form.
- Partially unscrew tube cap.
- Place tube near sample area.

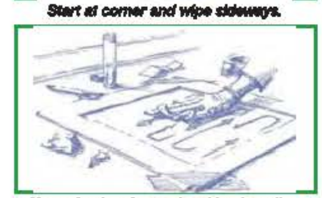
Step Three: Put on clean gloves

- Use disposable gloves.
- Use new gloves for each sample.
- DO NOT touch anything except the wipe after putting on the gloves.

Step Four: Wipe sample area and place wipe in sample tube

Floors

Start at corner and wipe sideways.



Now wipe in a forward and back motion.

- Do not touch other objects.
- Press the wipe down firmly at an upper corner of the sample area.
- Make as many "S"-like motions as needed to wipe the entire sample area, moving from side to side. Do not cross the outer border of the tape or template.
- Fold the wipe in half, keeping the dirty side in, and repeat the wiping procedure in the original direction in a forward and back motion.
- Fold the wipe again and repeat the wiping procedure, concetrating on collecting dust from the edges and corners of the sample area.

Step Four: (Continued)

- Fold the wipe again with the sample side folded in, and place the folded wipe into the sample tube.
- Cap the container. Discard the gloves into a trash bag.
- Label the centrifuge tube and record the dimensions of the sampling area.

Step Five: Measure the sample area

- Measure width and length (unless template was used).
  - Length of sill or trough between edges of tape
  - Width of sill or trough, measure at tape
- Measure to 1/8 inch.
- Do not remove tape until after measurements are taken.

Step Six: Record sample area dimensions on forms

- Calculate the sample area and record on sample collection form and laboratory chain-of-custody form.

Step Seven: Clean up

- Clean template with a clean wipe; place in a plastic bag for storage.
- Remove materials from site:
  - Gloves, tape from floors and windows, and used shoe covers
  - Put items in trash bag, NOT in client's trash containers
- Clean face and hands with warm, soapy water.
  - Use sanitary wipes if you do not have access to warm, soapy water
- Send the samples to a laboratory recognized by the National Lead Laboratory Accreditation Program (NLLAP) as being proficient in lead in dust analysis. For information on locating EPA-accredited labs, visit http://www.epa.gov/lead/pubs/nllaplist.pdf.

Evaluate the Results

- Compare the laboratory results to the EPA clearance standards for maximum allowable residual lead dust provided below:
  - Floors: 40 micrograms per square foot (µg/ft²)
  - Interior windowsills: 250 µg/ft²
  - Window troughs: 400 µg/ft²

These standards are for single-surface samples. The clearance standards for composite samples will be different depending on how many sub-samples are collected. Before collecting composite samples, check with your laboratory. Note that HUD discourages composite sampling when clearing federally-assisted housing.

Write the Report

- Use the standard report format.
- Sign the report.

Useful Resources

National Lead Information Center
1-800-424-LEAD (1-800-424-5323)
http://www.epa.gov/lead/pubs/nlic.htm

For a wide range of lead information—from outreach brochures to technical reports—on lead-based paint in the home.

National Lead Laboratory Accreditation Program
http://www.epa.gov/lead/pubs/nllaplist.pdf

For information on locating EPA-accredited labs.

Office of Pollution Prevention and Toxics
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (7404T)
Washington, DC 20460
202-566-0500
http://www.epa.gov/lead

For information on EPA lead-based paint regulations.

Office of Healthy Homes and Lead Hazard Control
U.S. Department of Housing and Urban Development (HUD)
451 Seventh Street, SW
Washington, DC 20410
202-755-1785
http://www.hud.gov/offices/lead

For information on the HUD lead-based paint regulations and technical assistance in complying with the HUD regulations for HUD-funded work.

United States Environmental Protection Agency
Office of Pollution Prevention and Toxics
EPA-W-04-022
May 2009

Lead Dust Sampling Technician Field Guide

APPENDIX C

TECHNICAL SPECIFICATIONS

Final

TECHNICAL SPECIFICATIONS

for
Community Soils Operable Unit
Residential Soils/Dust
Remedial Action Work Plan/Final Design Report

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

Pioneer Technical Services, Inc.
P.O. Box 3445
Butte, Montana 59702

TABLE OF CONTENTS

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GENERAL PROCEDURES

SUBSECTION 130.00 : SUBMITTALS

130.01 GENERAL

A. DESCRIPTION: The following specification includes the procedures for submitting "Shop Drawings" as is required in these specifications. Items that need to be reviewed by the ENGINEER are included with this specification. Also refer to the "Submittal" section of each Technical Specification section for additional requirements.

B. DEFINITIONS:

1. Shop Drawings: The term "shop drawings" includes drawings, diagrams, layouts, schematics, descriptive literature, manufacturer's information, illustrations, schedules, performance and test data, and similar materials requested by the ENGINEER to be furnished by the CONTRACTOR to explain in detail specific portions of the Work required by the Contract.

2. CONTRACTOR'S Review and Approval: The CONTRACTOR shall coordinate all submittals and review them for accuracy, completeness, and compliance with contract requirements and shall indicate his approval thereon as evidence of such coordination and review. All submittals shall be attached to the "Shop Drawing Submission" Form that is included in this Contract Document. The form shall be filled out, signed and stamped by the CONTRACTOR. Items submitted to ENGINEER without this form or CONTRACTOR'S stamp and approval will be returned for resubmission. By attaching this form to the submittal, the CONTRACTOR is representing that he has reviewed the entire submittal, that the submittal is in compliance with the Contract Documents, except as noted, and that the cover form applies to all documents that are attached to the form.

130.02 PRODUCTS

A. NONE.

130.03 EXECUTION

A. SUBMITTAL PROCEDURE: Shop Drawings shall be submitted as follows:

1. Date and Number: CONTRACTOR shall forward to ENGINEER all submittals required by the individual sections of the specifications. All submittals shall be returned to the CONTRACTOR within 7 days following their initial review. If follow-up reviews are required they shall be reviewed within 5 days. Unless a different number is called for in the individual sections, submit six copies of each shop drawing, six copies of all operation and maintenance instructions, and four specimens of each

sample requested, of which all but two copies will be retained by ENGINEER. The other copies shall be returned to the CONTRACTOR along with the ENGINEER'S comments. If the CONTRACTOR wants more than two copies sent to him he shall submit whatever additional copies he desires.

2. Cover Letter: All submittals shall be forwarded with a cover letter from the CONTRACTOR, identifying the project and the portion of the project to which it applies. Submittals that are related to or affect each other shall be forwarded simultaneously as a package to facilitate a coordinated review. Uncoordinated submittals will be rejected.

3. Modifications: Any modifications to the design proposed by the CONTRACTOR, shall be fully explained in the submittal. All necessary calculations and supporting documentation shall be included. If requested by the ENGINEER, the CONTRACTOR shall provide design drawings of the modification stamped by a professional engineer licensed to practice in the State of Montana.

130.04 ENGINEER'S APPROVAL

The ENGINEER will indicate his approval or disapproval of each submittal and, if he does not approve the submittal as submitted, will indicate his reasons therefore. Any work done prior to approval shall be at the CONTRACTOR'S own risk. Neither approvals nor lack of reviews or approval shall relieve the CONTRACTOR from responsibility for supplying materials and performing all work in accordance with the requirements of these Contract Documents. If submittals show variations from the Contract requirements, the CONTRACTOR shall describe such variations in writing, on the before mentioned form at the time of submission. Approval of such variation(s) shall be accompanied with a Contract Modification. Minor variations not involving a change in price or time of performance will not be issued a modification.

130.05 REQUIRED SUBMITTALS

A. Permits: Submit to the ENGINEER a copy of all permits required by the governing authorities, for which the CONTRACTOR is responsible.

B. Subcontractors: The CONTRACTOR shall supply a list of all suppliers and subcontractors to be used on the project.

C. Certificates: For those items called for in individual sections, furnish certificates from manufacturers, suppliers, or others certifying that materials or equipment being furnished under the Contract comply with the requirements of these specifications.

D. Shop Drawings: Including all materials and equipment supplied on the project. See the individual sections for specific requirements. If an alternate is proposed, explain fully and if approved, make all necessary adjustments needed to accommodate any differences in the product.

E. Progress Schedule and Sequence of Work Schedule: The CONTRACTOR shall submit to the ENGINEER, with the completed Agreement a Progress Schedule and Sequence of Work Schedule. The Sequence of Work Schedule shall show the order in which work shall be undertaken by the CONTRACTOR and shall show which items of Work shall be going on simultaneously. The Progress Schedule shall show estimated starting and completion dates for each part of the Work. The Progress Schedule shall be revised monthly to show project progress revisions to the schedules. The revised schedule shall be submitted monthly.

If the CONTRACTOR is behind schedule, he shall also submit a plan as to how he will get back on schedule.

G. Site-Specific Safety and Health Plan:

CONTRACTOR shall submit a written site specific Safety and Health Plan prior to commencing work. The plan, at a minimum, shall follow health and safety plan requirements outlined in 29 CFR 1910.120 (b).

H. Traffic Control Program: CONTRACTOR to provide as required in Section 550.

I. Materials Samples: CONTRACTOR shall also submit to ENGINEER for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that CONTRACTOR has satisfied CONTRACTOR'S responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.

J. Closeout Submittals: CONTRACTOR to provide all required closeout submittals.

<table>
<tr><td>TRANSMITTAL OF SHOP DRAWINGS</td><td>DATE</td><td></td><td>NEW SUBMITTAL</td><td></td><td>RESUBMITTAL</td></tr>
<tr><td rowspan="3">Pioneer Technical Services, Inc.
P.O. Box 3445
63 ½ West Broadway
Butte, Montana 59702

ATTN:

CC:</td><td colspan="3" rowspan="2">FROM:</td><td colspan="2">TRANSMITTAL NO.</td></tr>
<tr><td colspan="2">PROJECT NO.</td></tr>
<tr><td colspan="5">PROJECT TITLE AND LOCATION:</td></tr>
</table>

ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.)		MANUFACTURER OR SUPPLIER	NO. OF COPIES	SPECIFICATION PARAGRAPH & PAGE NO.	DRAWING NO.	BID TEM NO.
1							
2							
3							
4							
5							

LIST ALL VARIANCES FROM CONTRACT DOCUMENT REQUIREMENTS

I hereby certify that all Contractor's responsibilities under the Contract Documents with respect to review and submission of the above shop drawings have been satisfied and that each shop drawing has been stamped and/or marked to indicate Contractor's compliance with the Shop Drawing review requirements.

SIGNED____

(NAME & TITLE)

END OF SUBSECTION 130

SUBSECTION 160.00: EXISTING UTILITIES

160.01 GENERAL

A. DESCRIPTION: The following specification includes requirements for notifying utility owners, locating utilities, and possibly relocating utilities that may be affected by the Work. This shall include gas, water, sewer, phone, electric, private, and any other utilities encountered by the Work. Notifying utility owners and marking locations of all utilities shall be considered incidental to other work items, no additional compensation will be allowed.

B. UNDERGROUND AND PRIVATE UTILITIES: The location of underground and/or private utilities are not shown on the Drawings, and Atlantic Richfield Company assumes no responsibility for determining the exact location of utilities. Failure by Atlantic Richfield Company to show the existence of subsurface objects or installations on the plans shall not relieve the Contractor from his responsibility to locate and mark all buried and private utilities, nor relieve him from all liability for damages resulting from his operations. Underground and private utility location and documentation shall be completed by the Contractor in accordance with Atlantic Richfield Company's *Remediation Management – Control or Work (CoW) Defined Practices*, including completion of a Ground Disturbance Permit, blind sweep, potholing, and plot plan for each excavation area addressed in the Scope of Work.

The Contractor shall protect from damage private and public utilities, including telephone and telegraph cables, television cables, power lines, sewer and water lines, railroad tracks and appurtances, and similar facilities. In the event that any utilities are damaged or broken, they shall be immediately replaced (at the Contractor's expense) to a condition conforming to the standard repair procedure of the utility.

Any high voltage underground utility lines that may interfere with the specified work (e.g., possible buried electrical lines in alleys) shall be avoided completely by the Contractor. In such areas, the specified RA work shall not encroach on the underground utility any closer than the buffer distance specified by the utility owner.

Although the majority of residential areas involved with the work are assumed connected to city water and sewer utilities, the Contractor shall be aware that active or abandoned underground septic systems may be encountered in the course of the work. In such cases, the septic system shall be avoided and protected from damage to the extent practical. Abandoned septic systems that may be encountered through the course of the work may be requested to be backfilled by Atlantic Richfield Company. Compensation for backfilling abandoned septic systems will be per *miscellaneous work* as described in the Scope of Work.

160.02 MATERIALS

All materials used in repairing and relocating utilities shall be in accordance with the utility CoW requirements or owner's requirements, whichever is more stringent.

160.03 CONSTRUCTION REQUIREMENTS

A. NOTIFICATION: The Contractor shall be responsible for contacting the potentially affected utility agency(ies) in writing of his construction schedule, request their assistance in making accurate locations, and shall furnish a copy of the notice to Atlantic Richfield Company.

B. UNDERGROUND AND PRIVATE UTILITIES: Contractor shall be responsible for completing ground disturbance permits, conducting blind sweeps, potholing, completing plot plans, and completing all other utility documentation to ensure that all underground and private utilities within the work area are properly documented and located; in accordance with Atlantic Richfield Company's *Remediation Management – Control of Work (CoW) Defined Practices*. Contractor shall furnish a copy of the documentation to the on-site Atlantic Richfield Company representative.

C. CONFLICT WITH EXISTING UTILITIES: Where existing utilities are damaged or must be relocated, removed, or temporarily supported to allow the performance of the Work, the Contractor shall contact the utility's owner and make all arrangements and pay all costs associated with repair, relocation, removal, or temporary support of the utility. The Contractor shall comply with all requirements of the utility's owner.

D. TEMPORARY SERVICE: Temporary service shall be provided by the Contractor during any period when utility lines are disturbed. Service of domestic water lines and sewer lines shall not be interrupted for a period of more than 6-hours, unless otherwise approved by Atlantic Richfield Company in writing. The Contractor shall be solely responsible for notification of those individuals affected by being out of service and for temporary connections, if needed, if the time for interruption exceeds 6-hours.

END OF SUBSECTION 160

SUBSECTION 201.00: CLEARING AND GRUBBING

201.01 GENERAL

A. DESCRIPTION: This work shall consist of clearing, grubbing, removing, and disposing of soil, vegetation (including existing sod) and debris that may be located within residential areas specified to receive remedial action. Prior to initiating the construction activities, the Contractor shall request that the landowner remove large debris that may interfere with the work. The landowner shall be responsible for removing debris that may interfere with the work. If the landowner is not physically capable of removing debris or otherwise does not comply with the Contractor's request to remove large debris and/or debris piles, the Contractor shall remove debris as necessary to complete the specific work. Compensation for removal and replacement of debris will be per *miscellaneous work* as described in the Scope of Work.

Clearing and grubbing shall be limited to the areas designated on the Drawings or designated in the field by the Engineer. Large vegetation (i.e., trees, shrubs, hedges, etc.) and objects designated to remain shall be preserved free from injury and defacement.

If any evidence of aboriginal or historical activity or occupation is encountered during clearing and grubbing activities, the Contractor shall immediately stop work and notify the Engineer, who shall contact the proper authorities for an assessment of the significance of the resource.

The work shall be classified as follows:

1. Clearing: Clearing shall consist of removal and disposal of unwanted brush, logs, limbs, sticks, sawdust, rubbish, debris, vegetation (including existing sod), and other objectionable matter existing within the clearing limits that interfere with the excavation.

2. Grubbing: Grubbing shall consist of the removal and disposal of stubs, rock, roots, debris, and other objectionable matter from the grubbing limits.

3. Disposal: Disposal shall consist of removing and disposing of the refuse accumulations from clearing and grubbing operations as approved by the Engineer. The refuse resulting from these operations shall be disposed of as described below:

   A) Burial or burning of materials on-site will not be allowed.

   B) Debris resulting from clearing and grubbing activities shall be disposed as specified in Subsection 220 – Residential Soil

Disposal, of these Technical Specifications. Clearing and grubbing debris shall be disposed of at the appropriate Agency approved Waste Management Area (WMA), as indicated on the Drawings.

C) SALVAGING: Any materials denoted to be salvaged shall be carefully moved and stockpiled in the areas designated by the Engineer or Landowner. Salvaged materials are not to be used by the Contractor in the course of his work. Salvaged materials or resources are not the property of the Contractor.

201.02 MATERIALS

Not applicable.

201.03 CONSTRUCTION REQUIREMENTS

A. GENERAL: Clearing and grubbing shall be done at times and in a manner that the surrounding vegetation, adjacent property, and anything designated to remain shall not be damaged. Dragging, piling, disposing of debris, and other work that may be injurious to existing vegetation shall be confined to areas that carry no vegetation or that will be covered or disturbed by excavations.

Vegetation adjacent to areas designated to be disturbed shall be preserved and protected from injury unless the vegetation conflicts with construction operations and is designated by the Engineer or Landowner to be removed. If any vegetation designated to be preserved becomes damaged or destroyed by the Contractor, it shall be replaced to the satisfaction of the Engineer and Landowner at no additional cost.

The Engineer will designate trees, shrubs, plants, or other objects that are to remain. The Contractor shall preserve all objects so designated.

The Contractor shall not injure trees, shrubbery, vines, plants, grasses, and other vegetation growing outside of the limits of excavation and embankment. The Contractor shall paint all cut or scarred surfaces of trees or shrubs that are injured as a result of the Contractor’s activities. The paint shall be an approved asphaltum base paint prepared especially for tree surgery. Painting of injured trees or shrubs shall be considered incidental, no separate payment will be allowed.

B. CLEARING: All areas within the neat lines of cut or fill areas shall constitute the clearing limits.

Unless specifically designated to be saved, all trees, stumps, brush, logs, and other objectionable matter occurring within clearing limits shall be cut off and disposed of. All stumps within the clearing limits and all trees, the stumps of which are not to be grubbed, shall be cut at a height no greater than the diameter of the stump, and in any instance not more than 12 inches above the ground.

The refuse resulting from the clearing operation shall be removed and disposed as specified herein. In no case shall any unwanted material be left on the site, moved onto adjacent private properties, or be buried in embankments on the project.

C. GRUBBING: All areas within the neat lines of the disturbance limits shall also constitute the grubbing limits.

All stumps, roots, logs, or other timber more than 3 inches in diameter, and all brush, matted roots, rock, and other debris within the grubbing limits shall be pulled or otherwise removed.

All material resulting from the grubbing operations shall be disposed of as specified herein. All depressions below subgrade, or below the final surface of the ground resulting from the grubbing operations shall be backfilled with suitable material as specified in the Subsection 202 – Residential Yard Excavation and Backfill. Filling of depressions below design subgrade shall be considered incidental, no separate payment will be allowed.

END OF SUBSECTION 201

SUBSECTION 202.00: RESIDENTIAL YARD EXCAVATION AND BACKFILL/ COVER

202.01 GENERAL

A. DESCRIPTION: All residential excavation and backfill work shall be in accordance with these Specifications and in reasonably close conformity with the lines, grades, and depths shown on the Drawings or as established in the field by the Engineer.

1. Excavation: This work shall consist of performing all operations necessary to excavate, grade, and satisfactorily remove for disposal all soil materials encountered during excavation of the residential areas designated on the Drawings. The work, as designated on the Drawings, shall include gravel driveway excavation, garden soil excavation, excavation of yard sod and yard soils, paddock areas, any general unclassified excavation, and all other excavation not covered under other subsections of these Technical Specifications.

   Depth of excavation in yard/lawn areas shall be measured from below the existing sod cover, where applicable. Sod cover is typically in the range of 1- to 2-inches thick.

   Depth of excavation in earthen driveway areas shall be measured from 1-inch below the existing ground surface to account for existing aggregate surfacing materials overlying contaminated soils. The earthen driveways involved contain variable sized aggregate surfacing materials installed at different depths; to make excavation of earthen driveways consistent, each earthen driveway shall be assumed to contain a 1-inch layer of surface aggregate, and the design excavation depth shall be measured from below this assumed layer of aggregate.

   The maximum excavation depth shall not exceed 12-inches for any residential component (24 inches in vegetable gardens and flower gardens); excavation may also be performed at a depth of 2-inches or 6-inches (2-inches, 6-inches, 12-inches, 18-inches, or 24 inches in vegetable gardens and flower gardens), as specified Acceptable tolerance for depth of all excavations shall be the specified depth (2, 6, 12, 18, or 24-inches) +0.1 ft. or -0.0 ft.

   Contractor shall strive to assure that any temporary stockpiles of excavated contaminated soils are not left on residential property overnight. In the event that contaminated soil stockpile(s) are left overnight, the Contractor shall not locate the stockpile on uncontaminated ground and shall cover the entire stockpile with a tarpaulin or other sheeting that is adequately secured with stakes or ballast (e.g. sand bags, clean soil, etc.) to eliminate displacement from wind, pets, children, etc.

2. Backfill/Cover: This work shall consist of all operations necessary to replace, grade and complete surface preparations in the areas excavated during residential soils removal. The work, as designated on the Drawings, shall include driveway backfill (excluding aggregate surface materials, which are discussed in Section 820 of these Technical Specifications), walkway backfill, garden backfill, backfilling yard and paddock excavations and all other backfilling, covering or embankment not covered under other subsections of these Technical Specifications. **All excavations completed within residential areas shall be backfilled within 24-hours from the time when the excavation is finished.**

202.02 MATERIALS

A. REPLACEMENT SOILS MATERIALS: Suitable materials for residential soils replacement shall be taken from Atlantic Richfield and Agency approved sources meeting the following specifications.

COVER SOIL SUITABILITY CRITERIA
(TYPE A MATERIAL)

PARAMETERS	CRITERIA
Texture	(Cannot be sand, clay or loamy sand)
Rock Fragments	<45% by volume in the bank, 6-inch maximum rock diameter
Saturation Percentage	>25% and <85%
pH	>6.5 and <8.5 standard units
Electrical Conductivity	<4,000 umhos/cm with standard seed mix <6,000 umhos/cm for salt tolerant
Sodium Adsorption Ratio	<12 for root zone materials <20 for general fill
Total Elemental Concentration Arsenic Cadmium Copper Lead Zinc	 <100 mg/kg and approach 30 mg/kg <4 mg/kg <100 mg/kg <100 mg/kg <250 mg/kg
Organic Matter	Minimum 1.5% (existing or added as determined by Walkley Black)

μmhos/cm = micromhos per centimeter
mg/kg = milligrams per kilogram

Soils from approved sources shall be installed in all yard/lawn areas specified to be covered with sod or seed as well as in all vegetable and flower garden areas. Soils from the Type B Soil stockpile shall be installed and compacted in earthen driveway, walkway, paddock and rock garden areas beneath specified aggregates or decorative materials. Stumps, roots, rubbish, vegetation, frozen lumps, or other unsuitable materials will not be accepted.

B. AGGREGATE SURFACING MATERIALS: Requirements for driveway, walkway, and paddock top surfacing materials are specified under Subsection 820 - Aggregate Surface Materials, of the Technical Specifications.

C. EXCAVATED SOIL MATERIAL: Soils that are removed from residential yards shall be hauled and disposed at the Agency approved WMA, where shown on the Drawings. Disposal shall consist of dumping only; the disposed materials are not subject to spreading or compaction specifications.

202.03 CONSTRUCTION REQUIREMENTS

A. GENERAL: All excavation shall be considered unclassified and shall consist of the removal and disposal of any and all material encountered regardless of type or nature obtained within the construction limits designated on the Drawings.

All materials removed from excavation areas shall be hauled and disposed at designated location as described above, in Subsection 202.02.C.

B. SITE PREPARATION: All areas scheduled for excavation and embankment shall be photographed (by the Engineer or other representative designated by Atlantic Richfield Company) to document initial site conditions. The Contractor shall not begin excavation work until receiving written verification from the Engineer that a yard has been adequately photographed.

Prior to excavation, all buried utilities shall be located and marked, fences removed (as necessary), tree and shrub protection provided, structure and landscaping protection provided and construction staking completed (establishment of residential occupation lines).

C. LINE AND GRADE CONTROL: Prior to excavation, backfill, covering, grading, and embankment operations, the Contractor shall verify that an adequate number of construction stakes (installed by others) are in place to define the construction limits. As shown on the Drawings, occupation markers will be installed (by others) to establish the occupation perimeter associated with each residence. The location of each yard component associated with RA can be determined using these occupation markers in conjunction with the scaled maps (Individual Site Work Plans) provided in the Drawings.

All occupation markers (nails and flagging) shall be maintained, to the extent practical, for reference throughout the construction period.
Acceptable tolerance for depth of all excavations and depth of backfill/cover shall be specified depth (2, 6, 12, 18, or 24-inches) +0.1 ft. or -0.0 ft., measured from the datum described in Subsection 202.01, above. Excavation and cover depths will be verified, in the field, by Atlantic Richfield Company to assure that the specified limits are satisfied.

D. EXCAVATION:

1. General: The Contractor shall utilize excavating equipment appropriate for the work being performed. The method of excavation shall be the Contractor's responsibility. All methods and equipment used shall result in finished work meeting the construction tolerances specified. No work shall be performed beyond the construction limits without prior written approval from the Landowner and the Engineer. **Any excavations in residential areas that are to remain open overnight shall be properly barricaded with temporary construction fence (or other means approved by Atlantic Richfield Company) to serve as a warning to landowners, pedestrians, etc.**

2. Obstacles: In areas where excavation is required in the vicinity of large vegetation (e.g., trees, bushes, shrubs, hedges, etc.) specified to remain in-place, the excavation shall taper from the tree drip line to the design depth as shown on the Drawings. To avoid damaging the root system of trees, bushes, and shrubs, areas beneath the canopy of the tree, bush, shrub, or hedge shall not be disturbed, as shown on the Drawings.

   In areas where excavation is required in the vicinity of existing obstacles (fences, foundations, sidewalks, driveways, etc.) the excavation shall taper from the obstacle to the design depth as shown on the Drawings. The Contractor shall protect concrete or asphalt curbs, sidewalks, driveways, etc., from damage by his equipment throughout the course of the work.

   In areas where underground sprinkler systems are encountered, all sprinkler heads and associated plumbing shall be removed, as necessary, to allow unencumbered excavation of the specified materials. All removed sprinkler heads shall be salvaged and protected for later replacement. Removal of existing underground sprinkler systems to gain access to the work area shall be considered incidental, no additional payment will be allowed for sprinkler system removal. Compensation for reconstruction of underground sprinkler systems shall be as described in the Scope of Work.

E. SOIL REPLACEMENT:

1. Obtaining Backfill/ Cover Soil: Backfill/Cover Soil shall be obtained from Atlantic Richfield and Agency approved sources meeting project specifications. Any residential replacement soil materials temporarily stockpiled by the Contractor shall be re-handled and placed without additional compensation. The sites of all temporary stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded, if required, and returned to an acceptable condition.

2. Placing Backfill/Cover Soil: After excavation and depth verification has been completed, the replacement soils shall be deposited and evenly placed on the subgrade in lifts not to exceed 6-inches in depth, where compaction is required. Replacement backfill shall not be applied when the ground or replacement soil is frozen, excessively wet, or otherwise in a condition detrimental to the work. **All excavations completed within residential areas shall be backfilled within 24-hours from the time when the excavation is finished.**

   Minimal compaction will be performed using a cultipacker, hand roller or other proposed method(s) approved by the Engineer. Any large, stiff clods and hard lumps of soil shall be broken with a pulverizer or other effective means, and all stones or rocks (2-inches or greater in diameter), roots, litter or foreign material shall be raked up and disposed of by the Contractor.

   Acceptable depth tolerance for backfill/cover soil materials shall be the specified depth (2, 6, 12, 18, or 24-inches) +0.1 ft. or -0.0 ft., measured after grading and compaction

3. Compaction: Yard/lawn areas excavated to a depth of 12, 18, or 24-inches, and specified to receive sod or seed, shall be backfilled with soils obtained from the Type A Soil stockpile in the following manner:

   - The bottom of the excavation shall be backfilled in lifts not to exceed 6-inches and compacted so that the depth of backfilled soil after compaction is 6-inches. The backfilled materials shall be moisture conditioned and compacted by making a minimum of three passes over the entire subgrade surface using compaction equipment having a minimum impact force of 3,000 pounds.

   - An additional, minimally compacted lift of Type A soil shall then be applied over the compacted soil to a minimum depth of

6-inches (+0.1' or -0.0' tolerance), so that after sod is applied, it matches the surrounding ground surface elevation.

In backfill embankment areas specified to be overlain with Aggregate Mix No. 1, the replacement soils shall be obtained from the Type B Soil stockpile and evenly deposited on the subgrade in lifts not to exceed 6-inches in depth. The backfilled materials shall be compacted by making a minimum of three passes over the entire subgrade surface area with a vibratory compactor having a minimum centrifugal force of 25,000 pounds.

Compaction shall be performed in a manner that does not disturb adjacent structures (e.g., concrete sidewalks, foundations, buildings, trees, shrubs, hedges, etc.). Any damage to adjacent structures caused during compaction activities, shall be repaired by the Contractor at his own expense. Compaction specifications are further discussed in Subsection 820 – Aggregate Surfacing Materials of these Technical Specifications.

4. Finish Grading: Following backfill of the excavations with replacement soil (and compaction where specified), the backfill or soil cover shall be brought to the lines, grades, and cross-sections shown on the Drawings so that the final soil, sod or aggregate surface matches the surrounding ground surface elevation and topography. Where specific grades have not been established, the areas shall be smooth graded and the surface left at the prescribed grades in an even and properly compacted condition to prevent, insofar as practical, the formation of low areas or pockets where water will stand and to facilitate positive drainage away from buildings.

F. SEEDING, SODDING, AND CLEANUP: After fine grading work is accepted, seeding or sodding preparations can be completed in accordance with the Technical Specifications, Subsection 320-Fertilizing and Seeding and Subsection 323-Sodding, respectively.

The Contractor shall remove all tools, equipment, excess materials, debris, etc. from the vicinity of the work. The Contractor shall be responsible for general care of the backfill material and sod until the work is approved by Atlantic Richfield Company and the Contractor departs the site.

END OF SUBSECTION 202

SUBSECTION 203.00: PROVIDING AND/OR STOCKPILING BACKFILL AND COVER MATERIALS

203.01 GENERAL

A. DESCRIPTION: This work shall consist of furnishing, producing and hauling backfill/cover soil materials including any specified additives in accordance with these Specifications. Areas on site for stockpiling backfill material may be utilized, upon approval of the Engineer. Backfill materials at the source of supply are subject to the Engineer's approval prior to delivery of the materials to the project.

203.02 MATERIALS

Backfill/cover soils materials shall be obtained from Atlantic Richfield and Agency approved borrow sources meeting the following specifications.

COVER SOIL SUITABILITY CRITERIA
(TYPE A MATERIAL)

PARAMETERS	CRITERIA
Texture	(Cannot be sand, clay or loamy sand)
Rock Fragments	<45% by volume in the bank, 6-inch maximum rock diameter
Saturation Percentage	>25% and <85%
pH	>6.5 and <8.5 standard units
Electrical Conductivity	<4,000 umhos/cm with standard seed mix <6,000 umhos/cm for salt tolerant
Sodium Adsorption Ratio	<12 for root zone materials <20 for general fill
Total Elemental Concentration Arsenic Cadmium Copper Lead Zinc	 <100 mg/kg and approach 30 mg/kg <4 mg/kg <100 mg/kg <100 mg/kg <250 mg/kg
Organic Matter	Minimum 1.5% (existing or added as determined by Walkley Black)

µmhos/cm = micromhos per centimeter
mg/kg = milligrams per kilogram

Soils from approved sources shall be installed in all yard/lawn areas specified to be covered with sod or seed as well as in all flower and vegetable garden areas. Soils from the Type B Soil stockpile shall be installed and compacted in earthen driveway, walkway, paddock and rock garden areas beneath specified aggregates or decorative materials. Stumps, roots, rubbish, vegetation, frozen lumps, or other unsuitable materials will not be accepted. Excavated areas (yard/lawn areas, gardens, earthen driveways, and rock gardens) shall be backfilled with appropriate combinations of borrow soil materials and/or aggregates as indicated on the Drawings.

Acceptable depth tolerance for backfill materials and depth of soil cover (where specified) shall be the specified depth (2, 6, 12, 18, or 24-inches) +0.1 ft. or -0.0 ft., measured from the datum described in Subsection 202.01 of these Technical Specifications. Excavation and cover depths will be verified, in the field, by Atlantic Richfield Company to assure that the specified tolerance limits are satisfied.

The Contractor shall provide all testing required, at no cost to the Owner, for approval of any materials source (other than the approved source) prior to delivery of the materials to the site. Such testing shall be done by an approved testing laboratory. At a minimum, arsenic analysis, gradation analysis and moisture-density relationships will be required for each proposed source. Additionally, soil texture shall be determined using the American Society of Agronomy Monograph No. 9 Method. Such tests shall be completed at the Contractor's expense.

203.03 CONSTRUCTION REQUIREMENTS

The Contractor shall be responsible for obtaining all backfill materials from the stockpiles or source areas and hauling to the specified excavated areas. Backfilling excavated areas shall be completed in a manner to satisfy the cross-sections shown on the Drawings.

Any temporary soil stockpile areas, proposed by the Contractor, shall be cleared of weeds, roots, stumps, rocks and other contaminating matter. The cleared matter shall be disposed of in accordance with Subsection 201 – Clearing and Grubbing, or as otherwise approved by the Engineer. Any soil stockpile sites shall occupy a minimum area. Equipment or methods that cause segregation, degradation or contamination of the material shall not be used when delivering materials from the borrow source or storage area.

END OF SUBECTION 203

SUBSECTION 206.00: HAUL

206.01 GENERAL

A. DESCRIPTION: This work shall consist of loading and hauling material excavated or removed from its original location and transporting it to its final specified location as stated in each Individual Site Work Plan, specific to each residence, lot, or alley. The work shall include dumping or unloading hauled material in a location that will facilitate placement as specified under other Subsections of these Technical Specifications, watering for dust control, and the installation and removal of temporary facilities such as fences. The work shall also include all signing and traffic control, including flagmen, if necessary. This work also applies to hauling of soil, aggregates, other miscellaneous excavated materials, and construction materials, where necessary.

206.02 MATERIALS

Materials for this item are covered under Construction Requirements, below.

206.03 CONSTRUCTION REQUIREMENTS

A. HAUL: All materials to be hauled shall be removed from their original location and placed in trucks or other suitable equipment capable of transporting the material without spillage. Haul routes shall be determined by the Contractor. During transport, soil materials shall be wetted , as necessary, to prevent airborne emissions.

END OF SUBSECTION 206

SUBSECTION 220.00: RESIDENTIAL SOIL DISPOSAL

220.01 GENERAL

A. DESCRIPTION: This work shall consist of loading, hauling, dumping, stockpiling, and disposing of the soils excavated from the residential sites at the designated disposal area. The work shall also include dust control and cleanup of any spillage.

B. EXCAVATED SOIL STOCKPILES: Contractor shall strive to assure that any temporary stockpiles of excavated contaminated soils are not left on residential property overnight. In the event that contaminated soil stockpile(s) are left overnight, the Contractor shall cover the entire stockpile with a tarpaulin or other sheeting that is adequately secured with stakes or ballast (e.g. sand bags, clean soil, etc.) to eliminate displacement from wind, pets, children, etc.

220.02 MATERIALS

Materials for this item are covered under Construction Requirements, below.

220.03 CONSTRUCTION REQUIREMENTS

A. HAULING and STOCKPILING: Residential soils shall be hauled from the excavation areas and dumped in locations specified on the Drawings or by the Engineer. **During transport, excavated residential soils shall be covered or adequately wetted in the haul vehicle to prevent airborne emissions.** Traffic control shall be in accordance with Subsection 550 - Traffic Control. Streets, sidewalks, alleys, etc., shall be washed by the Contractor if soil is tracked due to spillage, etc.

Equipment that is used for hauling contaminated materials will be subject to proper decontamination procedures prior to using the same equipment for backhauling clean soil. The Atlantic Richfield Company representative shall inspect and approve decontaminated equipment prior to using equipment for backhauling clean soil. The Contractor may use separate/dedicated equipment for hauling contaminated materials vs. hauling clean soil to reduce the frequency of equipment decontamination.

B. DISPOSAL: Soils that are removed from residential yards shall be hauled, disposed of, and consolidated at the Agency approved waste management area (WMA), as shown on the drawings. The soil shall be dumped in stockpiles or windrows, spread, and consolidated within the designated area. Consolidated material shall be placed in maximum 12-inch lifts and consolidated per the scope of work and/or construction drawings.

END OF SUBSECTION 220

SUBSECTION 221.00: ATTIC DUST DISPOSAL

220.01 GENERAL

A. DESCRIPTION: This work shall consist of loading, hauling, and disposing of all materials and debris generated during residential attic dust remedial action at the designated disposal area. The work shall also include dust control and cleanup of any spillage.

B. ATTIC DUST DEBRIS STOCKPILES: Contractor shall not leave attic dust debris stockpiles on residential property overnight. Contractor shall ensure that all materials that are removed shall be hauled and consolidated within the same work day.

220.02 MATERIALS

Materials for this item are covered under Construction Requirements, below.

220.03 CONSTRUCTION REQUIREMENTS

A. HAULING and STOCKPILING: Attic dust debris shall be hauled from the residence and disposed of within the project approved disposal site. **During transport, attic dust debris shall be covered or adequately wetted in the haul vehicle to prevent airborne emissions.** Traffic control shall be in accordance with Subsection 550 - Traffic Control. Streets, sidewalks, alleys, etc., shall be washed by the Contractor if soil is tracked due to spillage, etc.

Equipment that is used for hauling contaminated materials will be subject to proper decontamination procedures prior to being used on any tasks other than a contaminated material haul. The Atlantic Richfield Company representative shall inspect and approve decontaminated equipment prior to use. The Contractor may use separate/dedicated equipment for hauling contaminated materials to reduce the frequency of equipment decontamination.

B. DISPOSAL: Materials that are removed from residential attics shall be disposed of within the nearest permitted Class II landfill, in accordance with all solid waste regulations.

END OF SUBSECTION 221

SUBSECTION 310.00: FENCES

310.01 GENERAL

A. DESCRIPTION: To the extent practical, the Contractor shall not disturb existing fences. When fence removal is warranted, the work shall consist of temporarily removing (where necessary, to provide access to the work area) and either resetting or constructing new fences. The types of fences to be removed and replaced will vary. Any fences that are removed by the Contractor to gain access to the work area shall be replaced using salvaged materials from the original fence, to the extent practical, or replaced using new materials that are the same type as those removed. All replaced fences shall be oriented along the original alignment. Unless otherwise directed by the Landowner and Atlantic Richfield Company.

Existing fences in poor condition that are removed to gain access to the work area shall be replaced using salvaged materials from the original fence, to the extent practical. In any case, the reconstructed fence shall incorporate new vertical posts, rails, and/or fabric, as necessary, to result in a structurally sound final product of comparable or better quality than the original fence.

Removal of existing fences to gain access to the work area shall be considered incidental, no additional payment will be allowed for fence removal. Compensation for reconstruction of fences will be as described in the Scope of Work.

310.02 MATERIALS

Any new fencing materials shall be the same type as those temporarily removed, or as otherwise approved by the Landowner and Atlantic Richfield Company. Any salvaged fencing materials shall be stored and maintained in good quality throughout re-installation. Any fencing materials designated to be salvaged, that are damaged as a result of the Contractor's activities, shall be replaced at the Contractor's expense.

310.03 CONSTRUCTION REQUIREMENTS

A. CLEARING AND LEVELING FENCE LINES: Irregularities in the ground line upon which the fence is to be constructed shall be leveled to the satisfaction of the Engineer. All trees, shrubs, brush, rock, and other obstacles that interfere with proper construction of the fence shall be removed by the Contractor and disposed of in accordance with Subsection 201 - Clearing and Grubbing. In performing the operation of clearing and leveling, a minimum amount of terrain shall be disturbed.

B. TEMPORARY FENCE CONSTRUCTION: Erect temporary Construction Fence along removed fence alignments, and open excavations, as necessary, to keep pets, etc. enclosed in the residential yard area and to keep pedestrian and vehicular traffic out of the work area. Temporary fences shall remain in place only until the work in a specific area is completed. Replace the salvaged fence materials or construct new fence as soon as practical after the necessary work is completed. Use an adequate number of braces, panels, deadmen, and other accessories, as necessary, to maintain the temporary fence in a functional manner.

Undamaged materials used in the temporary fence that meets specifications for the permanent fence may be used as the permanent fence. Materials not used in permanent fencing shall remain the Contractor's property. Remove all temporary fences at the Contractor's expense.

Installation of temporary construction fence along removed fence alignments and open excavations shall be considered incidental, no additional payment will be allowed.

C. REMOVE AND RESET FENCE: When removing and resetting a fence, furnish all new required materials, over and above the usable salvaged fence, that are necessary to construct the fence. Use, to the extent practical, materials of the same type and quality as those of the old fence that meet the Landowner's and Atlantic Richfield Company's specifications.

Replace rotten, damaged, or broken posts and unusable panels with new materials. Do not use any galvanized materials with abraded or broken coatings. Carefully handle and store, at designated locations, all removed fence materials specified to be salvaged. Compensation for reconstruction of fences will be as described in the Scope of Work.

END OF SUBSECTION 310

SUBSECTION 315.00: CHAIN LINK FENCES AND GATES

315.01 GENERAL

A. DESCRIPTION: This work shall consist of constructing new 4-feet-tall chain link fences and gates along the same alignment as existing fences. New chain link fences and gates shall only be constructed when agreed to by the Landowner and Atlantic Richfield Company when an existing fence is in poor condition and it is not practical to be replaced using salvaged materials.

Removal of existing fences to gain access to the work area shall be considered incidental, no additional payment will be allowed for fence removal. Compensation for construction of chain link fences and gates will be as described in the Scope of Work.

B. SUBMITTALS:

1. Submit in accordance with Section 130.00.

2. Submit sufficient information to show conformance with the requirements of this specification and the Drawings. This information shall include, but not be limited to, the following:

   i. Dimensions and weights of all fence posts, gate posts, rails, truss rods, gate frame.
   ii. Dimensional cross sections of posts and rails.
   iii. Typical arrangement drawings showing fence and gate post lengths and post spacing.
   iv. Materials and coatings.
   v. Chain link fabric height and weight.
   vi. Applicable ASTM standards.

315.02 MATERIALS

A. CHAIN LINK FENCING: Chain link fence fabric shall be 4 feet high as indicated on the Drawings. Use 11 gauge wire woven in a 2-inch mesh with an aluminum coating conforming to ASTM A491, or a 2.0 ounce per square foot galvanized coating conforming to ASTM A392, Class 2. Twist and barb top and bottom selvages. Use 9 gauge aluminum or 11 gauge galvanized steel tie wires at not more than 24-inch spacing.

B. LINE POSTS:

1. Use SS40 or standard weight galvanized steel pipe as follows:
   i. 4’ Fence Height: 1.90 inches O.D. (2.72 lb/ft).

2. Concrete foundations for fence posts shall be as detailed on the Drawings and as specified in Subsection 830 – Structural Concrete.

C. TOP AND BRACE RAIL:

1. Use SS40 or standard weight (2.27 lb/ft) galvanized steel pipe 1.66 inches O.D. with a 10-foot span vertical bending strength of 202 pounds. Provide 6-inch long top rail couplings spaced at not more than 21 feet. Attach fabric to top rail with 9 gauge aluminum or 11 gauge steel tie wires at intervals not exceeding 24-inches.

D. TERMINAL, CORNER, AND GATE POSTS:

1. For terminal and corner posts use SS40 or standard weight galvanized steel pipe as follows:
   i. 4’ Fence Height: 2.375 inches O.D. (3.65 lb/ft).

2. Gate posts for 4-foot fence heights:
   i. For gates less than 6-feet wide use SS40 or standard weight galvanized steel pipe 2.875 inches O.D.
   ii. For gates 6 to 13 feet wide use SS40 standard weight galvanized steel pipe 4.00 inches O.D.

3. Concrete foundations for fence posts shall be as detailed on the Drawings and as specified in Subsection 830 – Structural Concrete.

E. MISCELLANEOUS:

1. Tension wire: 7-gauge galvanized steel coiled spring tension wire.

2. Tension bars: 1/4 inch thick steel, 3/4 inch wide.

3. Truss rods: 3/8 inch diameter rods with drop forged turnbuckles or other approved type of adjustment.

F. GATES:

1. General: Provide chain link gates as shown on the Drawings. Gate shall be same height as adjacent fence. Gate shall be hinged to swing through 180 degrees from closed to open. Provide complete with latches, locks, stops, keepers, hinges, fabric and braces. Keepers shall be manufacturer's standard, located on gate or ground.

2. Frame: Construct of round zinc-coated steel members conforming to Federal Specification RR-F-191/2A. Provide intermediate members and diagonal truss rods or tubular members as necessary to provide rigid construction, free from sag or twist. Gates shall have a 1.66-inch O.D. horizontal interior bracing member. Joints between tubular members shall be made by welding or by means of heavy fittings. Connections shall be rigid and weathertight. Truss rods shall be

3/8-inch minimum diameter. The padlock shall be accessible from both sides of the gate.

3. Fabric: Conform to the requirements for chain link fabric described in paragraph 315.02 A. herein. Attach to gate frame ends by use of bolt hooks, stretcher bar bands and stretcher bars, or by other methods standard with the manufacturer, except that welding the fabric to the gate frame will not be permitted. The top and bottom of fabric shall be attached with specified wire ties at intervals not exceeding 14 inches on centers.

G. GALVANIZING:

1. Hot-dip galvanize all fittings and hardware per ASTM A 153. Hot-dip galvanize all frames, gates, and fabrications with a Class 2 (2.0 ounce per square foot) coating, per ASTM A 123. Galvanizing shall occur after fabrication.

315.03 CONSTRUCTION REQUIREMENTS

A. INSTALLATION OF CHAIN LINK FENCING:

1. General: Install fence as shown on the Drawings and in accordance with the manufacturer's recommendations. Chain link fabric shall be stretched with mechanical equipment.

2. The area to be fenced shall be uniformly and smoothly finish graded before beginning the fence installation. Except where crossing a drainage ditch, the finish grade shall not deviate from a straight line by more than 3 inches.

3. All posts shall be embedded into the ground in concrete footings as shown on the Drawings. Allow concrete footings to cure for seven days before installing fence.

4. Fence fabric shall be continuous around the perimeter of the fenced area as shown on the Drawings. Fence fabric shall be securely fastened to the outward side of the posts with the lower edge at the ground level. Fencing and gates shall be properly braced to prevent sagging.

5. Provide post braces for each gate, corner, pull and end post consisting of a brace rail and a diagonal truss rod with turnbuckle.

6. Post caps shall consist of ornamental caps. The cap shall be provided with a hole suitable for the through passage of the top rail.

7. Top rails shall be in lengths not less than 18 feet, and shall be fitted with couplings or swedged for connecting the lengths into a continuous run. Means shall be provided for attaching the top rail to each gate, corner, pull and end post.

8. Install gates in accordance with manufacturer's instructions. Demonstrate that all gates swing smoothly without binding or dragging, that all gates are lockable, and that all gate hardware operates properly.

9. Where crossing a drainage ditch, a line post shall be provided at the top of slope on each side of the ditch and the fabric shall follow a straight line between the posts. Where ditch crossings are wider than the standard line post spacing, maintain specified line post spacing by installing additional line posts as needed within the ditch section. Line posts within the ditch shall be additional height as needed to maintain straight fabric. Within the ditch, between the line posts, short post sections shall be embedded to a minimum depth of 4 feet at a maximum spacing of 12 inches on center across the ditch. Posts shall be long enough to overlap the fabric by 12 inches, and each post shall be fastened to the fabric by a minimum of 3 tie bands. Install posts within the ditch with care to prevent displacement of ditch lining materials.

END OF SUBSECTION 315

SUBSECTION 320.00: FERTILIZING AND SEEDING

320.01 GENERAL

A. DESCRIPTION: This work shall consist of ground surface preparation; furnishing, applying and incorporating fertilizer into the soil; furnishing and planting seed; tracking; and cleanup. The work includes temporary and permanent seeding.

B. CERTIFICATIONS:

1. Indigenous Seed: Defined by MCA 80-5-101(4):

   "Indigenous seeds include the seeds of those plants that are naturally adapted to an area where the intended use is for revegetation of disturbed sites. These species include grasses, forbs, shrubs and legumes."

   The Contractor shall supply the Engineer with all seed bag tags and a certification from the supplier stating that the seed complies with the Federal Seed Act and the Montana Seed Laws (MCA 80-5-101 through 305).

2. Fertilizer: Fertilizer shall be delivered in standard size bags from the manufacturer showing weight analysis and manufacturer's name, or in bulk quantities accompanied with written certifications from the manufacturer stating that the fertilizer supplied complies with applicable specifications.

320.02 MATERIALS

A. INDIGENOUS SEED: All seed shall comply with and be labeled in accordance with the Montana Seed Law. MCA 80-5-104(2) states...

"indigenous seeds, as defined in 80-5-101, in amounts of 1 pound or more, whether in package or bulk, must be labeled with the following information"

(a) . . . the statement "Labeled only for reclamation purposes;"

(b) . . . lot number or other distinguishing mark;

(c) . . . the common name, genus, species and subspecies, when applicable, including the name of each kind of seed present in excess of 5%. When two or more kinds of seed are named on the label, the label shall specify the percentage of each. When only one kind of seed is present in excess of 5% and no variety name or type designation is shown, the percentage must apply to seed of the kind named. If the name of the variety is given, the name may be associated with the name of the kind. The percentage in this case may be shown as "pure seed" and must apply only to seed of the variety named;

(d) . . . state or county of origin;

(e) . . . the approximate percentage of viable seed, together with the date of test. When labeling mixtures, the percentage viability of each kind shall be stated;

(f) . . . the approximate percentage by weight of pure seed, meaning the freedom of seed from inert matter and from other seeds;

(g) . . . the approximate percentage by weight of sand, dirt, broken seeds, sticks, chaff and other inert matter;

(h) . . . the approximate total percentage by weight of other seeds;

(i) . . . the name and approximate number of each kind of species of prohibited and restricted noxious weed seeds occurring per pound of seed;

(j) . . . the full name and address of the person, firm or corporation selling the seed.

As listed in the Montana Seed Law, seed shall contain no "PROHIBITED" noxious weed seed. The seed shall contain no "RESTRICTED" noxious weed seed in excess of the maximum numbers per pound as specified by MCA 80-5-105 or as specified by the appropriate County Weed Board, whichever is more stringent.

The number of seed allowed per pound, for all other noxious weed seeds shown on the "restricted list" will be zero.

Seed shall be grown in the North American continent above 41 degrees north latitude. Known varieties whose origin is above the 41st parallel but grown below are acceptable. All seed shall be a standard grade adapted to Montana conditions. Seed which has become wet, moldy or otherwise damaged will not be accepted.

Calculations of “pure live seed" may be made on the basis of either a germination test or a tetazolium test in addition to the purity analysis. Seed shall be applied on a “pure live seed" basis. The quantity of pure "live seed" in a 100 lb. container shall be determined by the formula: 100 multiplied by germination percentage and this product multiplied by the purity percentage (for example, if the seed is 85% pure and test 90% germination, then a 100 lb. container would contain 76.5 lbs. of pure "live seed"). For residential lawn areas specified to be seeded instead of application of sod, the seed mix used shall be as follows:

SEED MIX FOR RESIDENTIAL LAWNS – MIX NO. 1

Grass Species	Lbs. PLS/10,000 square feet[1,2]
Kentucky Bluegrass	3.6
Perennial Ryegrass	1.5
Creeping Red Fescue	0.9
Total	**6.0**

[1] PLS = Pure Live Seed

[2] Reported rates are for drill seeding; rates shall be doubled for hydraulic seeding and broadcast seeding.

The residential lawn seed mix and rate specified above can be considered a guideline. The Contractor may propose a different seed mix, as suggested by the seed supplier; however, any proposed seed mix shall be subject to approval by the Engineer prior to application. For residential lawn areas, the actual application rate shall be determined as follows:

1) Confirm the total specified surface area to be seeded (units of square feet), as indicated on the Individual Site Work Plan.

2) Divide the total surface area (units of square feet) by 10,000. This will be the total weight of the seed required for the area involved.

3) Use appropriate methods to evenly apply the total weight of seed required throughout the entire area involved.

For non-residential lawn areas specified to be seeded with the Uplands Seed Mix, as indicated on the Individual Site Work Plan, the seed mix used shall be as follows:

NATIVE SEED MIX FOR UPLANDS AREAS – MIX NO. 2

Common Name	Lbs. PLS/acre[1,2]
Basin wildrye	8.0
Mammoth wildrye	5.0
Canada bluegrass	0.5
Intermediate wheatgrass	1.0
Hard sheep fescue	1.0
Streambank wheatgrass	2.0
Birdsfoot trefoil	0.5
Annual Ryegrass	2.0
Total	**20.0**

[1] PLS = Pure Live Seed

[2] Reported rates are for drill seeding; rates shall be doubled for hydraulic seeding and broadcast seeding.

Areas prepared for seeding during the period of May 1 through October 14 shall be seeded with a temporary seed mix. The temporary seed mix used shall be as follows:

TEMPORARY SEED MIX FOR UPLANDS AREAS – MIX NO. 3

Common Name	Lbs. PLS/acre[1,2]
Annual Ryegrass	10.0
Total	**10.0**

[1] PLS = Pure Live Seed

[2] Reported rates are for drill seeding; rates shall be doubled for hydraulic seeding and broadcast seeding.

Permanent seeding of these areas shall then commence during the fall at a time approved by the Engineer.

B. FERTILIZER: Fertilizer shall be a soluble commercial carrier of available plant food element or combination thereof. All specified areas shall be fertilized with an inorganic chemical fertilizer with the following nutrients and associated rates:

Nitrogen (Elemental)	60.0 $\pm$ 1.0 lbs./acre
Phosphorus (P_20_5)	80.0 $\pm$ 1.0 lbs./acre
Potassium (K_20)	150.0 $\pm$ 1.0 lbs./acre

The fertilizer shall be in uniform composition and in good condition for application by suitable equipment. It shall be labeled with the manufacturer's guaranteed analysis as governed by applicable fertilizer laws. Any fertilizer which becomes contaminated or damaged, making it unsuitable for use, will not be accepted.

320.03 CONSTRUCTION REQUIREMENTS

A. GENERAL: Areas to be seeded and fertilized shall be completed, in reasonable conformity, to specified lines and grades prior to seeding and fertilizing, and are subject to approval by the Engineer.

Residential yards specified to be seeded with Seed Mix No. 1 can be seeded at any time. Areas specified to be seeded with the Native Uplands Seed Mix (Seed Mix No. 2) and finished during the period of October 15 through April 30 shall be permanently seeded within this time period. The Contractor must obtain the Engineer’s permission to commence seeding operations. Areas finished during the period of May 1 through October 14 and subject to being seeded with the Native Upland Seed Mix (Seed Mix No. 2) shall be seeded with the Temporary Uplands Seed Mix (Seed Mix No. 3) during this time period. The permanent seeding of these areas shall then commence during the fall at a time approved by the Engineer.

It is necessary, insofar as it is practicable and feasible, as determined by the Engineer, that the seedbed surface, at the time of application of seeds, not be excessively wet, snow-covered, or frozen and be reasonably free of large lumps, clods, and impervious crusts of dirt; that there be no appreciable areas of loose soils which can feasibly be compacted; that the surface, to a depth of approximately 4-inches, not be so tightly compacted that seed cannot begin growth. The Contractor shall treat such areas, as required by the Engineer, to attain, as nearly as practicable, the condition described.

Excessively tight or compacted soils shall be loosened to the minimum depth of 4 inches. Discing, harrowing, tilling, or hand raking of the soil shall be done at right angles to the natural flow of water on the slopes, unless otherwise approved by the Engineer. Compaction of the soil when required shall be performed by equipment which will produce a uniform rough textured surface ready for seeding and mulching.

Existing structures and facilities shall be adequately protected and any damage done by the Contractor shall be repaired or adjusted to the satisfaction of the Engineer.

B. APPLICATION OF FERTILIZER: Fertilizer shall be applied to the accepted seedbed surface at the rate as specified in this Technical Specification. Mechanical or hydraulic methods of application are acceptable so long as a uniform application at the specified rate is accomplished. The fertilizer application method is subject to approval by the Engineer.
The fertilizer shall be incorporated into the surface soil by discing, raking, or shallow plowing to a maximum depth of 2 inches. Exceptions will be made for seed drills that are capable of incorporating the fertilizer and seed directly into the seedbed. In no instance shall subsoil be incorporated into the seedbed as a result of this operation. Fertilizer shall be incorporated with equipment operated at right angles to the slope of the land.

If the Contractor is required to temporarily mulch the prepared area, fertilization will be completed at the time of permanent seeding. The application methods and methods for incorporating the fertilizer into the seedbed shall be as specified herein.

C. SEED DISTRIBUTION:

1. General: Seed shall be applied to the conditioned seedbed no longer than 48 hours after the seedbed has been conditioned.

   Broadcast or hydraulic seeding methods shall not be used during adverse weather conditions as determined by the Engineer.

The applied seed, regardless of the method of application, shall not be covered by a soil thickness greater than ½ inch in depth.

2. Seeding by Drill: Seeding equipment used for applying grass seed must be designed, modified or equipped to regulate the application rate and planting depth of grass seed. If equipment for sowing cover crop seed is not equipped with press wheels, the seed shall be compacted with a cultipacker immediately after the ground has been drilled. Seed must be uniformly distributed in the drill hopper during the drilling operation. Acceptable drills include: custom seeders, furrow drills, disc drills, no till drills or other drills approved by the Engineer. All grass establishment equipment shall be operated normal to the slope drainage.

   Planting depth shall be regulated by depth bands or coulters. To provide for more even distribution of seed on sloping areas, the drill box shall be partitioned by dividers no more than 24 inches apart. A drill shall be no wider than the width of the area over which it is to operate.

   The rows of planted seed shall be a maximum of 8 inches apart and shall be at right angles to the natural slopes.

3. Broadcast Seeding: Seeding by hand or mechanical broadcasting will be permitted on areas inaccessible to drills or impractical to seed by other prescribed methods. Broadcast seeding requires the approval of the Engineer.

4. Hydraulic Seeding: Hydraulic seeding equipment may be used. Seed and mulch will be applied in separate and distinct operations except for the following:

   When using the hydraulic seeding method, the Contractor must provide 1 pound of wood fiber or organic mulch per each 3 gallons of water in the hydraulic seeder as a cushion against seed damage. The mulch used as a cushion may be part of the total required mulch with the remainder applied after the seed is in place.

   When hydraulically applying mulch in a separate operation, the Contractor may mix the seed with the fertilizer if his hydraulic seeding equipment is capable of uniformly mixing water, fertilizer, and seed - in that order - and power blowing or spraying the mixture uniformly over the seedbed. After blending, the slurry shall be applied to the seedbed within 45 minutes after the seed has been added to the water/fertilizer mixture. If the slurry cannot be applied within the specified 45 minutes, it shall be fortified, at no cost to the Owner, with the correct ratio of seed to the remaining slurry and a new 45-minute time frame established for applying the fortified mixture.

The Contractor may be required to use extension hoses to reach the extremities of slopes.

The Contractor shall remove any excessively rutted equipment tracks on the seedbed prior to final mulching, as required by the Engineer. The Contractor shall use a rake, small harrow, or other acceptable means to remove the tracks.

D. TRACKING: All seeded and fertilized areas may or may not require tracking. Tracking shall be accomplished using a tracked vehicle equipped with grousers sufficient to groove the surface to at least ½-inch depth. The tracking vehicle shall be operated so as to completely cover the surface with grouser marks. All grouser marks shall run perpendicular to the natural slopes. The tracking vehicle shall be operated alternately between forward and reverse on each pass to eliminate damage to the seedbed resulting from 180 degree skid turns.

If the area is seeded by hydraulic methods, tracking of the slopes shall be done at such time when the surface has had sufficient time to dry. The length of time established will be at the discretion of the Engineer. Hand raking following application of seed may necessary, at the discretion of the Engineer.

E. SEEDING DATES:

1. Residential yards specified to be seeded with Seed Mix No. 1 can be seeded at any time.

2. Permanent seeding of Uplands Areas (areas specified to receive Seed Mix No. 2) shall be permitted from October 15 through April 30.

3. Areas finished during the period of May 1 through October 14 and subject to being seeded with the Native Upland Seed Mix (Seed Mix No. 2) shall be seeded with the Temporary Upland Seed Mix (Seed Mix No. 3) during this time period. The permanent seeding of these areas shall then commence during the fall at a time approved by the Engineer.

END OF SUBSECTION 320

SUBSECTION 323.00: SODDING

323.01 GENERAL

A. DESCRIPTION: This item shall consist of furnishing, hauling, and placing approved live sod on prepared areas in accordance with this specification at the locations shown on the Drawings or as directed by the Engineer.

323.02 MATERIALS

A. SOD: All sod installed under this project shall originate from planted grass species on cultivated agricultural land and grown specifically for "Cultivated Turfgrass Sod" purposes. It shall have been irrigated and mowed regularly and carefully and otherwise maintained from planting to harvest to assure reasonable quality and uniformity. All sod shall be 100% free of all noxious weeds.

1. Thickness of Cut: Sod shall be machine cut at uniform soil thickness of 0.60 inch (15 mm), plus or minus 0.25 inch (6 mm), at the time of cutting. Measurement for thickness shall exclude top growth and thatch.
2. Pad Size: Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 0.5 inch (15 mm) on width and plus or minus five percent on length. Broken pads and torn or uneven ends will not be accepted.
3. Strength of Turf Sod Sections: Standard size sections of sod shall be strong enough that it can be picked up and handled without damage.
4. Moisture Content: Sod shall not be harvested or transplanted when its moisture content (excessively dry or wet) may adversely affect its survival.
5. Mowing Height: Before harvesting, the sod shall be mowed uniformly at a height of 1 to 2.5 inches (25 to 60 mm).
6. Thatch: Sod shall be relatively free of thatch, up to 0.5 inch (15 mm) allowable (uncompressed).
7. Diseases, Nematodes and Insects: Sod shall be reasonably free of diseases, nematodes and soil-borne insects.

B. SOIL FOR REPAIRS: The soil for fill and topsoiling of areas to be repaired shall conform to the specifications contained in Subsections 202 and 203 of these Technical Specifications.

323.03 CONSTRUCTION REQUIREMENTS

A. GENERAL: Areas to be sodded shall be where shown on the Drawings (Individual Site Work Plans). Suitable equipment necessary for proper preparation of the ground surface and for the handling and placing of all required materials shall be on hand, in good working condition, and shall be approved by the Engineer before the various operations are started. The Contractor shall demonstrate to the Engineer before starting the various operations that the application of required materials will be made as specified.

B. GROUND SURFACE PREPARATION: After grading of areas has been completed, areas to be sodded shall be raked or otherwise cleared of stones larger than 1-inch in any diameter, sticks, stumps, and other debris which might interfere with sodding, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other means occurs after grading of areas, the Contractor shall repair such damage, to the satisfaction of the Engineer. This may include filling low areas, smoothing irregularities, and repairing other incidental damage. Soil surface preparation shall be performed using a cultipacker, hand roller or other proposed method(s) approved by the Engineer.

C. OBTAINING AND DELIVERING SOD: Sod shall be installed within 48 hours from the time it is stripped by the supplier at the source, unless circumstances beyond the Contractor's control make storage necessary. In such cases, upon approval by the Engineer, the sod shall be stacked, kept moist, and protected from exposure to the air and sun and shall be protected from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Sod shall be placed as soon as practical after backfilling of the specified area occurs.

D. SOD PLACEMENT: Sod placement shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used. **All areas specified to receive sod shall be watered to moisten and lower the temperature of the prepared soil immediately prior to laying the sod.** The quantity of water applied to the prepared soil shall be limited to a practical amount that does not cause excessively muddy conditions.

The sod shall be moist and shall be placed on a moist earth bed. Pitchforks shall not be used to handle sod, and dumping sod from vehicles will not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen when replacing it, shall work from ladders or treaded planks to prevent further displacement. Soils of good quality shall be used to fill all cracks between individual sod pieces. The quantity of the fill soil shall not cause smothering of the grass.

Where the grades are such that the flow of water will be from paved or concrete surfaces across sodded areas, the surface of the soil underlying the sod shall be set approximately one inch below the pavement or concrete edge after compaction. Where the flow will be over the sodded areas and onto the paved or concrete surfaces, the surface of the soil underlying the sod shall be placed flush with pavement or concrete edge after compaction.

F. WATERING: Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until installation is complete and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities of water and shall avoid damage to the finished surface.

G. ESTABLISHING TURF: The Contractor shall provide general care for the sodded areas as soon as the sod has been laid until the Engineer has accepted the work and the Contractor has removed all his equipment from the site. After the sod installation has been approved by the Engineer, care for the new sod becomes the responsibility of the Landowner.

H. REPAIRS: When the surface has become gullied or otherwise damaged during installation, the affected areas shall be repaired to re-establish the grade and acceptable condition of the soil, as directed by the Engineer, and shall then be resodded as specified in Subsection 323.03.

END OF SUBECTION 323

SUBSECTION 330.00: MULCH

330.01 GENERAL

A. DESCRIPTION: This work shall consist of covering and processing specified seeded areas with mulch consisting of the specified materials.

B. SUBMITTALS: The following submittals are required in accordance with the Special Provisions:

- Manufacturer's specifications and material content for hydromulch products which may be used on the project.
- Manufacturer's recommended application methods and rate for hydromulch products which may be used on the project.
- “Weed Seed Free” certification for hay or straw mulch.

330.02 MATERIALS

A. GENERAL: Vegetative mulch or hydromulch may be used on the project as dictated by site-specific conditions.

B. VEGETATIVE MULCH: This type of mulch material shall be composed of grass hay, wheat straw, rye straw, or barley straw, in that order of preference.

1. Grass Hay: This type of mulch material shall be composed primarily of perennial grasses. The grass hay mulch shall contain greater than 70% grass by weight and shall not contain greater than 10% alfalfa, crested wheatgrass or yellow sweet clover. Grass hay is subject to the Engineer's approval and must be "Montana Noxious Weed Seed Free Hay" provided by a certified supplier.

2. Straw: This type of mulch material shall be clean grain straw, shall be "Montana Noxious Weed Seed Free" straw and shall not contain greater than 5% cereal seed by weight, i.e., seed heads. Written confirmation from a certified supplier will be required.

Chopped or ground material is not acceptable. The mulch material is not acceptable if it is musty, moldy or rotted, or if it contains seed bearing stalks of noxious weeds. It shall be free of stones, dirt, roots, stumps or other foreign material.

C. TACKIFIER: Tackifier shall be a biodegradable organic formulation processed specifically for the adhesive binding of mulch. The tackifier shall uniformly disperse when mixed with water and shall not be detrimental to the homogeneous properties of the mulch slurry. Any tackifier which has been moisture damaged or damaged by other means will not be acceptable.

Tackifier may be added either during the manufacturing of the mulch or incorporated during mulch application.

Organic soil and mulch tackifier for use in hydraulically planting of seeds shall consist of specifically blended compatible hydrocolloids. Starch-based tackifiers are unacceptable.

Soil and mulch tackifier shall be applied at a minimum rate of 40 pounds per acre on slopes 2:1 or flatter, or at 80 pounds per acre, or more on slopes steeper than 2:1, or at manufacturer's recommendations, as approved by the Engineer.

When applied, the organic soil and mulch tackifier shall form a loose chain-like protective film, but not a plant inhibiting membrane, which will allow moisture to percolate into the underlying soil, while helping "stick" seeds, fertilizer and other specified materials to the soil surface during germination and initial seedling growth, after which the organic soil and mulch tackifier shall breakdown by microbial action.

330.03 CONSTRUCTION REQUIREMENTS

A. GENERAL: Mulch, when required, must be applied to seeded areas not more than 24 hours after seeding regardless of the type used. If the Contractor does not mulch within 24 hours after seeding, the Contractor may be required to re-seed the project at no additional cost. Mulch shall not be applied in the presence of free surface water, but may be applied upon damp ground. Mulch shall not be applied to snow-covered ground surfaces.

Mulch shall not be applied to areas having a substantial vegetative growth, such as grasses, weeds and grains. Areas not to be mulched shall be determined by the Engineer. Mulching shall not be done during adverse weather conditions or when wind prevents uniform distribution. Application, if after seeding, shall be in a manner to not seriously disturb the seedbed surface.

B. APPLICATION OF VEGETATIVE MULCH: Vegetative mulch shall be applied after seeding and fertilizing is completed unless otherwise specified. The mulch shall be applied in a uniform manner by a mulch spreader or by hand at a rate of 3,000 pounds per acre. The mulch spreader shall be designed specifically for this type of work. The vegetative material shall be fed into the mechanical mulch spreader at an even, uniform rate.

Straw or native hay shall be uniformly spread at the rate specified. Unless otherwise specified by the Engineer, straw or hay shall be anchored into the seedbed by using a mulch crimper. Straw or hay mulch shall be pliable. If straw breaks during crimping, it shall be sprinkled with water, not soaked, to facilitate placement.

The mulch crimper, specifically designed for this type of work, shall have round, flat (not angled), notched blades of these approximate dimensions: ¼ inch thick by 18 inches in diameter and spaced 8 to 9 inches apart. The crimper shall have sufficient weight to force the vegetative mulch a minimum of 3 inches into the soil and shall be equipped with disc scrapers. Mulch crimping shall be done on all slopes capable of being safely traversed by a tracked vehicle. All mulch crimping shall be done perpendicular to the flowline of the slope.

C. FINISHING: Prior to final acceptance of the project, the Contractor shall immediately re-mulch any area from which the original mulch may have been washed or blown. If the original seedbed and seeding is damaged due to the displacement of the mulching material, the seedbed shall be repaired and reseeded prior to re-mulching. The operations described in this paragraph shall be at the Contractor's expense if the damage is due to his negligence.

END OF SUBSECTION 330

SUBSECTION 540.00: PROVIDE WATER

540.01 GENERAL

A. DESCRIPTION: This item shall consist of furnishing and applying water required in all compaction work, sod placement, and dust control all in accordance with the requirements of these Technical Specifications.

540.02 MATERIALS

Water shall be reasonably clean and free from acid, oil, alkali, or vegetable substances and shall not be brackish or salty. If the Contractor uses a source of water other than that provided by Atlantic Richfield Company, the Contractor shall be responsible for obtaining any necessary water rights, permits, and for payment of any royalty costs on the water provided. The source of water to be used shall be indicated to the Engineer prior to its use.

540.03 CONSTRUCTION REQUIREMENTS

Water, when required, shall be applied at the locations and in the amounts required to properly complete the work. An adequate supply of water shall be provided by the Contractor to complete the project as specified. The equipment used for watering shall be of ample capacity (minimum capacity of 1,000 gallons) and of such design as to assure uniform application of water in the amount required.

In the watering of subgrades and embankments, the Engineer may require the Contractor to apply water in such quantities that the subgrade and embankment shall be compacted to a moisture content in excess of "optimum moisture." When so required, the amount of water required in excess of "optimum moisture" will not be greater than 3%. The Contractor shall also apply water during the course of the work to control dust, maintaining all embankment and base courses in a damp condition.

The Contractor shall provide watering for dust control during construction and for maintenance of traffic on public roadways and other access roads as required by the Engineer.

END OF SUBSECTION 540

SUBSECTION 550.00: TRAFFIC CONTROL

550.01 GENERAL

A. DESCRIPTION: Traffic control shall consist of furnishing, installing, maintaining, and relocating necessary traffic signs, barricades, lights, signals, pavement markings, and other traffic control devices necessary to insure the safety of the general public and project personnel. This work shall include flagging for the guidance of traffic through the work zone(s) and the furnishing and application of water for dust control.

B. OPERATIONS: The Contractor shall conduct his operations so that there is a minimum interruption in the use of the roads and highways involved at all times.

The Contractor shall schedule his operations to keep all roads and streets open to a minimum of one-way traffic during normal working hours during construction. Two-way traffic shall be provided at all times during overnight and weekend periods.

All work shall be coordinated with Anaconda-Deer Lodge County (ADLC) and shall be performed in accordance with the Contract Documents, the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) as published by the U.S. Department of Transportation, the Montana Department of Transportation (MDT) Standard Specifications for Road and Bridge Construction, the approved Traffic Control Plan, and as otherwise required by the Engineer.

C. SUBMITTALS:

1. Traffic Control Plan: The Contractor shall submit a traffic control plan for any work involving public roadways. All traffic control plans shall be submitted and accepted prior to construction and shall meet the requirements specified herein. The traffic control plan shall include the following as appropriate:

- Itemization of signing, including: type, size, shape, color, location, and MUTCD reference.
- Temporary pavement markings for traffic channelization (cones, barrels, barricades, etc.).
- Flagging, including personnel numbers and location.
- Road closures and time(s) of road closures.
- Special traffic patterns (pilot cars, one-way traffic lanes, detours).
- Signage during non-work hours.

The Traffic Control Plan will be subject to review and approval by the MDT for roads under their jurisdiction, by the appropriate county for roads under county jurisdiction, and by any other public entity having jurisdiction over other public roadways (U.S. Forest Service, city, etc.). These approvals will be in addition to those provided by the Engineer in accordance with the Submittals Section. No work shall commence until all approvals of the Traffic Control Plan have been secured.

550.02 MATERIALS

All traffic control devices and materials shall be in accordance with MDT Standard Specifications for Road and Bridge Construction, most current edition.

550.03 CONSTRUCTION REQUIREMENTS

All devices utilized for traffic control shall be in accordance with the requirements of the MUTCD for Streets and Highways, most current edition. **All high visibility cones, barrels, candles, etc. used by the Contractor for traffic control shall be 42 inches in height (minimum).**

Before placement of any traffic control for any stage of construction, the Contractor shall have on hand, at the project site, all necessary traffic control devices required for that construction stage. All traffic control devices necessary for construction shall be properly placed and in operation and approved before any construction is allowed to start. All devices shall be constructed and erected in a workmanlike manner and shall be properly maintained, cleaned, and operated during the entire time they are used. They shall remain in place only as long as they are needed and shall be removed immediately thereafter. Where operations are performed in stages, there shall be in place only those signs that apply to the present stage of construction. Signs that do not apply to the existing conditions shall be covered with opaque material, turned, or removed, so as not to be readable to oncoming traffic.

Construction equipment, vehicles, materials, and debris shall be stored or parked a minimum of 30 feet from the edge of the traveled way or behind guardrails, etc., as appropriate. When it is not feasible to park equipment or store materials a minimum of 30 feet from the edge of the traveled way or behind guardrails, adequate warning devices and protective measures shall be utilized.

All traffic control devices furnished by the Contractor shall remain the property of the Contractor and shall be removed from the project when their use is no longer required. All properly installed traffic control devices shall be replaced by the Contractor when destroyed by traffic.

The Contractor shall schedule his construction operations in a manner that will assure: 1) the safety and convenience of motorists and pedestrians, and the safety of construction workers, are adequately met at all times; and 2) the project is completed in a manner most beneficial to the project as a whole. Traffic control shall be provided in full compliance with MUTCD during materials hauling and equipment operation or transport along public roadways.

END OF SUBSECTION 550

SUBSECTION 820.00: AGGREGATE SURFACING MATERIALS

820.01 GENERAL

A. DESCRIPTION: This work shall consist of furnishing and placing aggregate surfacing courses composed of crushed gravel, or stone, or other similar materials meeting the grade or maximum size specified in these Technical Specifications or as shown on the Individual Site Work Plan. Placement shall be in conformance with these specifications.

B. SUBMITTALS: The following submittals are required:

- Gradation(s) of all specified aggregate materials.

820.02 MATERIALS

A. SUBGRADE EMBANKMENT MATERIAL: Subgrade embankment material used to partially backfill 12, 18, and 24-inch deep excavations shall consist of material obtained from the Type B Soil stockpile. Type B Soil materials placed as embankment in driveway, walkway, paddock and rock garden areas shall be moisture conditioned and compacted (maximum 6-inch loose lifts) by making a minimum of three passes over the entire subgrade surface area with a vibratory compactor having a minimum centrifugal force of 25,000 pounds.

B. GENERAL CRUSHED TOP SURFACING MATERIALS: To be installed on aggregate driveways, aggregate walkways, alleys and possibly boulevard areas.

1. General: Materials specified to be applied as the top surface on aggregate driveways, aggregate walkways, alleys or on boulevard areas shall consist of both fine and coarse fragments of crushed stone or crushed gravel, and/or natural gravel, and when approved by the Engineer, may be blended with sand, finely crushed stone, crusher screenings, or other similar materials. The completed mixture of aggregates shall be capable of being compacted into a dense and well-bonded base.

   The method used in production shall be such that the percentage of fractured particles occurring in the finished product shall be as nearly constant and uniform as practicable. The crushing shall result in a product that at least 20% of the material retained on a No. 4 mesh sieve will have at least one fractured face. If necessary to meet this requirement or to eliminate an excess of fines or uncrushed particles, gravel shall be screened before crushing.

2. Gradation: As determined by "Montana Test Method MT-202", the general crushed top surfacing material shall meet the following gradation requirements:

TABLE OF GRADATION – GENERAL CRUSHED TOP SURFACING MATERIAL (AGGREGATE MIX No. 1)

Sieve Size	Percentage (by Weight) Passing Square Mesh Sieves
1”	100
3/4"	90-100
No. 4	40 - 70
No. 10	25 - 55
No. 200	2 - 10

a. General crushed top surfacing material shall be placed at a minimum depth of 6-inches (+0.1-foot and –0.0-foot tolerance). Backfilling and compaction shall be completed in such a manner that the top surface of the aggregate matches the surrounding ground elevation on all sides after compaction.

B. DECORATIVE TOP SURFACING MATERIALS: To be installed on rock gardens or other specified paddock areas.

1. General: Aggregate materials specified to be applied as the top surface on rock gardens or other specified paddock areas shall consist of reasonably-rounded coarse river rock, as approved by the Engineer. The standard sizes of aggregate described in this classification may be manufactured by means of any suitable process used to separate raw material into the desired size range. Standard sizes may also be produced by blending two or more different components.

In rock garden and other paddock areas specified to receive decorative top surfacing materials, two layers of woven geotextile shall be cut to size and installed directly below the specified top surfacing materials as shown on the Drawings. The purpose of the woven geotextile is to act as a vegetation/weed barrier. It shall meet the following specifications and be subject to approval by the Engineer.

WOVEN GEOTEXTILE SPECIFICATIONS

PROPERTY	TEST METHOD	ENGLISH	METRIC
Tensile Strength (Grab)	ASTM D-4632	370 x 220 lbs	1,646 x 979 N
Elongation	ASTM D-4632	20 x 15%	20 x 15%
CBR Puncture	ASTM D-6241	1,250 lbs	5,563 N
Trapezoidal Tear	ASTM D-4533	115 x 75 lbs	511 x 334 N
UC Resistance (% Retained at 500 Hrs)	ASTM D-4355	90%	90%
Apparent Opening Size (AOS)	ASTM D-4751	30 US Std. Sieve	0.600 mm
Percent Open Area	CW-02215 MOD	8%	8%
Permittivity	ASTM D-4491	1.50 sec^{-1}	1.50 sec^{-1}
Water Flow Rate	ASTM D-4491	115 gpm/ft^2	4,685.6 lpm/m^2

Installation of woven geotextile sheeting beneath the specified materials will be considered incidental to this work item, no additional payment will be allowed.

2. Gradation: As determined by ASTM C 136 (Method for sieve Analysis of Fine and Coarse Aggregates) the decorative top surfacing material shall meet the following gradation requirements:

TABLE OF GRADATION – DECORATIVE TOP SURFACING MATERIALS (AGGREGATE MIX No. 2)

Sieve Size	Percentage (by Weight) Passing Square Mesh Sieves
2”	100
1½”	90 – 100
1”	50 – 70
3/4"	10 – 30
No. 4	0 – 5

a. Decorative top surfacing materials shall be placed at a minimum depth of 2-inches (+0.1-foot and –0.0-foot tolerance). Backfilling shall be completed in such a manner that the top surface of the decorative material matches the surrounding ground elevation on all sides.

C. OTHER DECORATIVE TOP SURFACING MATERIALS: Other materials (e.g., lava rock, colored rock, wood or bark chips, etc.) specified to be applied as the top surface on gardens, boulevards, or other specified paddock areas shall consist of the same, or reasonably similar material as that which was removed, as requested by the Landowner. In these situations, the material proposed by the Contractor shall be approved by the Engineer and the Landowner prior to installation. Compensation for installation of other top surfacing material shall be on a Time and Materials basis.

Other top surfacing materials shall be placed at a minimum depth of 2-inches (+0.1-foot and –0.0-foot tolerance). Backfilling shall be completed in such a manner that the top surface of the decorative material matches the surrounding ground elevation on all sides.

820.03 CONSTRUCTION REQUIREMENTS

A. GENERAL: Immediately prior to placing the top surfacing course, the surface of the underlying embankment or subgrade shall be smooth and shaped to the cross section as shown on the Drawings before the top surfacing course is placed. No top surfacing course shall be placed upon wet or muddy materials.

Subgrade materials shall be placed in horizontal layers of not more than 6-inches loose thickness. Type B Soil material placed as embankment in driveway, walkway, paddock and rock garden areas shall be moisture conditioned and compacted by making a minimum of three passes over the entire subgrade surface area with a vibratory compactor having a minimum centrifugal force of 25,000 pounds.

The depositing and spreading of the material on the prepared subgrade shall commence at the point farthest from the point of loading, unless otherwise instructed, and shall progress continuously without breaks. Hauling over the subgrade will not be permitted at such times and in such manner as to be detrimental to the subgrade. The material shall be deposited and spread in a uniform layer without segregation of size to such loose depth that when compacted, the layer will have the required thickness. Spreading shall be as necessary to distribute the material in a uniform layer.

Material placed shall be compacted to the full width by rolling with approved equipment. Any irregularities or depressions that develop under rolling shall be corrected by loosening the material in these places and adding or removing material, as the case may require, until the surface is smooth and uniform.

Spreading and compacting shall be performed alternately as required to maintain a smooth, even, uniformly compacted surface until the final inspection. Along structures and at all places not accessible to the roller, the surfacing course material shall be tamped thoroughly with approved mechanical tampers or hand tampers to obtain a density conforming to the compaction requirements.

B. COMPACTION REQUIREMENTS FOR TOP SURFACING COURSES: Aggregate Mix No.1 placed as the top surfacing course in driveway, walkway, and paddock areas shall be moisture conditioned and compacted by making a minimum of three passes over the entire subgrade surface area with a vibratory compactor having a minimum centrifugal force of 25,000 pounds (this compaction specification is not applicable to rock garden or paddock areas specified to receive Aggregate Mix No. 2 or other decorative top surfacing materials).

END OF SUBSECTION 820

<u>SUBSECTION 830.00: STRUCTURAL CONCRETE</u>

830.01 GENERAL

A. <u>DESCRIPTION</u>: This work includes installation of structural concrete for construction of sidewalks, curbs, driveways, fence posts, etc. Protect existing sidewalks, curbs, driveways, fences, foundations, etc., from damage throughout the course of the work. Repair any damage to existing sidewalks, curbs, driveways, fences, foundations, etc., resulting from construction activities, at the Contractor's expense.

When agreed to by the Landowner and Atlantic Richfield Company, re-construct existing dilapidated sidewalks, curbs, driveways, etc. The Contractor will be compensated on a per square foot basis in these instances.

Supply sufficient concrete forms and concrete to complete the specified work. Furnish structural concrete meeting all specified requirements that is composed of Portland cement, aggregates, and water. Furnish ready-mixed concrete meeting ASTM C94.

830.02 MATERIALS

A. <u>CLASSIFICATION</u>: Concrete is classified below.

M-3000 is concrete with ¾-inch (19.05 mm) maximum aggregate and a 28-day strength of 3,000 pounds per square inch psi (20.7 Mpa).

C-3000 is concrete with 1 ½-inch (38.1 mm) maximum aggregate and a 28-day strength of 3,000 psi (20.7 Mpa).

If concrete strength or durability requirements established by design exceed the above strength classifications, the Engineer may specify additional concrete classifications to meet those requirements.

B. <u>COMPOSITION OF CONCRETE MATERIALS</u>: Upon receipt of the notice of award of the contract, furnish the Engineer with names of suppliers and locations of sources of materials proposed for use.

1. <u>Materials:</u>

i. Unless otherwise specified, assure cementitious material meets ASTM C150 Type II without adding cementitious or pozzolanic mineral admixtures.

ii. Aggregates - Assure aggregates meet ASTM C33. .

iii. Water - Use concrete mixing water meeting the requirements of ASTM C94.

iv. Admixtures – If required, use admixtures meeting the following requirements:

Air entraining admixtures - ASTM C260
Chemical admixtures - ASTM C494
Chemical admixtures for use in producing flowing concrete - ASTM C1017
Calcium Chloride - ASTM D98

Use admixtures in the concrete that are the same as those used in the concrete represented by submitted field test data or in trial mixtures.

2. Performance and Design Requirements:

i. Cementitious material content - Assure the cementitious material content is adequate to meet the specified requirements for strength, water-cement ratio and finishing requirements. Assure the cement content is at least that indicated on Table B2a. Acceptance of a lower cement content is contingent upon verification that concrete mixtures with a lower cement content will meet the specified strength requirements and will produce concrete with equal finish quality, appearance, durability, and surface hardness.

Table B2a- MINIMUM CEMENT CONTENT REQUIREMENTS

Nominal Maximum size of aggregate, in(mm)	Minimum cement content lb/yd^3 (kg/m^3)
1-1/2 (38.1)	520 (163.0)
3/4 (19.05)	540 (187.3)

ii. Slump – For sidewalk, driveway, or fence post construction, furnish concrete at the point of delivery having a slump of 3 to 5 inches as determined by ASTM C143. For curb construction, furnish concrete at the point of delivery having a slump less than 3 inches as determined by ASTM C143.

iii. Size of coarse aggregate - Assure the nominal maximum size of coarse aggregate does not exceed three-fourths of the minimum clear spacing between reinforcing bars; one-fifth of the narrowest dimension between sides of forms; or one-third of the thickness of slabs or toppings.

iv. Air Content **-** Concrete must be air entrained. Assure air content at the point of delivery is between 5% and 7%.

v. Concrete Temperature- If freezing temperatures are anticipated, receive approval from Atlantic Richfield Company for special cold weather concrete mix, placement and curing. Deliver concrete that does not exceed 90° F.

830.03 CONSTRUCTION REQUIREMENTS

A. CONSISTENCY: Use the minimum quantity of mixing water necessary to provide workability within the ranges of slump specified.

B. CONCRETE PLACEMENT:

1. Forms: Design and construct forms to produce concrete structures to the width, depth, thickness and shape necessary. Design forms, braces, crossties and wales to withhold pressures and forces based on a liquid having a density of 150 pounds per cubic foot and any anticipated construction loads or impacts. Construct grout tight forms in a manner that allows removal of the forms without damage to the concrete. Construct forms of wood or steel, with countersunk bolts and/or crossties that results in flat, smooth surfaces for exposed surfaces. Exposed surfaces are those surfaces that will remain above finished ground level. Adequate wetting of the forms or the use of a release agent to facilitate removal of the forms without damaging the concrete is encouraged.

2. Placement**:** Accurately place and thoroughly compact concrete into its final position. Vibrate the concrete or use other methods to assure it is thoroughly consolidated around fittings and embedded items, contacts all form surfaces and minimizes voids. Assure all reinforcement and embedded items are accurately placed as shown on the plans and are clean and free from coatings of dried mortar, detrimental rust, scale, oil or foreign matter. Use pumps, troughs, chutes and/or pipes to place the concrete in a manner that will not displace the reinforcement or cause segregation of the concrete mix. Screed the top surfaces to the lines and grades shown on the plans.

3. Finishing**:** Finish all concrete surfaces not contained within forms or in contact with the soil by hand finishing using wood or magnesium

floats or trowels. Trowel the surface at the appropriate time(s) to produce a smooth surface free of pits, scars or other deformations.

C. CURING CONCRETE: For concrete surfaces subject to premature drying, either cover as soon as possible with canvas, plastic sheets with sealed joints, burlap and sand or other satisfactory materials and keep concrete moist, or if the concrete surfaces are not covered, keep them moist by flushing or sprinkling. Continue curing for at least 7 days after placing the concrete. Concrete surfaces placed against forms may be cured by leaving the forms in place for at least 7 days, when approved.

Protect concrete against freezing or other conditions detrimental to strength development meeting the applicable requirements of this specification.

To aid finishing, side forms for curbs and sidewalks may be removed after 12 hours, not to exceed 48 hours, depending on weather conditions. Continue moist curing during the concrete finishing operation.

Untreated forms and existing concrete must be kept continuously wet for at least 1 hour before concrete is placed therein. Keep wet until covered with concrete.

F. WEATHER AND NIGHT LIMITATIONS:

1. General**:** Do not place concrete when darkness prevents obtaining the specified placing and finishing work. Night operations may be conducted with written approval and when approved artificial lighting is provided.

2. Protection of Concrete: During the curing period, if the air temperature is anticipated to fall below 32°F (0°C), provide an approved blanket type insulating material along the work for covering all concrete that has been in place for 7 days or less. If, at any time, the ambient temperature drops to 32°F (0°C) or less, protect the concrete using a method approved by the Engineer.

END OF SUBSECTION 830

APPENDIX D

STANDARD DRAWINGS

FINAL
STANDARD DRAWINGS FOR
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS / DUST
REMEDIAL ACTION WORK PLAN/FINAL DESIGN REPORT

PREPARED FOR

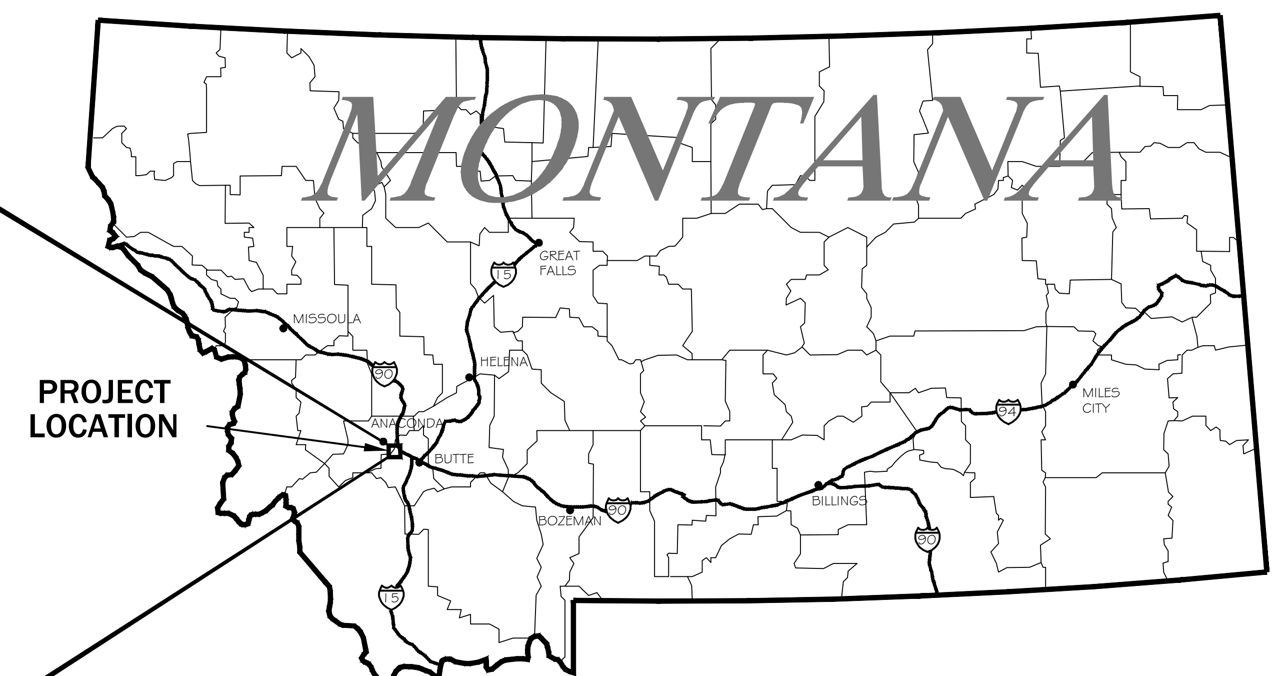
ATLANTIC RICHFIELD COMPANY

PREPARED BY

PIONEER TECHNICAL SERVICES, INC.

AUGUST 2015

SITE VICINITY MAP



SHEET 1

GENERAL NOTES

1. CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES AND UTILITY OWNERS AND DETERMINE EXACT LOCATION OF ALL UNDERGROUND UTILITIES BEFORE COMMENCING WORK. NOTICE TO UTILITIES (LOCATE TICKETS) SHALL BE SUBMITTED TO ATLANTIC RICHFIELD COMPANY; 48-HOUR NOTICE IS REQUIRED. CONTRACTOR IS RESPONSIBLE FOR PROTECTING AND REPAIRING ANY DAMAGED UTILITIES. CONTRACTOR SHALL NOTIFY ONE-CALL UTILITY LOCATE AT (800) 424-5555 AT LEAST 48-HOURS PRIOR TO CONSTRUCTION.

2. CONTRACTOR SHALL NOTIFY THE ATLANTIC RICHFIELD COMPANY REPRESENTATIVE OF ALL UTILITIES ENCOUNTERED DURING CONSTRUCTION AND SHALL NOT BACKFILL UNTIL THE CONTRACTOR HAS MADE A RECORD OF ITS TYPE, SIZE, AND LOCATION.

3. CONTRACTOR SHALL RESPECT ALL RIGHT-OF-WAY BOUNDARIES. CONTRACTOR IS TO PROTECT FROM DAMAGE, BUILDINGS, WALLS, MONUMENTS, TREES AND OTHER LANDSCAPING, UTILITY POLES, AND OTHER FEATURES INSIDE AND OUTSIDE ANY RIGHTS-OF-WAY.

4. EXCAVATION:
A: GENERAL: THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DESIGNING AND CONSTRUCTING STABLE, TEMPORARY EXCAVATIONS AND SHALL SHORE, SLOPE, OR BENCH THE SIDES OF THE EXCAVATIONS AS REQUIRED TO MAINTAIN STABILITY OF THE EXCAVATION SIDES AND BOTTOM. ALL EXCAVATIONS SHALL COMPLY WITH APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS INCLUDING THE CURRENT OSHA EXCAVATION AND TRENCH SAFETY STANDARDS. CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR, WHO SHALL ALSO BE SOLELY RESPONSIBLE FOR THE MEANS, METHODS, AND SEQUENCING OF CONSTRUCTION OPERATIONS. UNDER NO CIRCUMSTANCES SHOULD THE INFORMATION PROVIDED BE INTERPRETED TO MEAN THAT THE ATLANTIC RICHFIELD COMPANY IS ASSUMING RESPONSIBILITY FOR CONSTRUCTION SITE SAFETY OR THE CONTRACTOR'S ACTIVITIES. SUCH RESPONSIBILITY IS NOT BEING IMPLIED AND SHALL NOT BE INFERRED.

B: EXCAVATION AND SLOPES: IN NO CASE SHOULD SLOPE HEIGHT, SLOPE INCLINATION, OR EXCAVATION DEPTH, INCLUDING UTILITY TRENCH EXCAVATION DEPTH, EXCEED THOSE SPECIFIED IN LOCAL, STATE, AND FEDERAL SAFETY REGULATIONS. SPECIFICALLY, THE CURRENT OSHA HEALTH AND SAFETY STANDARDS FOR EXCAVATIONS, 29 CFR PART 1926, SHALL BE FOLLOWED.

5. CONTRACTOR SHALL REMOVE AND REPLACE ALL EXISTING FEATURES DISTURBED DURING CONSTRUCTION TO ORIGINAL CONDITION, AND AS OTHERWISE DIRECTED, INCLUDING BUT NOT LIMITED TO, SIGNS, MAILBOXES, ENTRANCE STRUCTURES, DRAINAGE DITCHES, APPROACHES, DELINEATORS, GRAVEL SURFACES, CONCRETE STRUCTURES INCLUDING CURBS AND SIDEWALKS, ASPHALT PAVEMENT, AND FENCES. CONTRACTOR SHALL FIELD VERIFY EXTENT OF THIS WORK PRIOR TO BID AND INCLUDE THE COST OF THIS WORK IN THE UNIT PRICES.

6. ALL FENCES REMOVED TO ALLOW FOR CONSTRUCTION SHALL ONLY BE REMOVED AFTER RECEIVING PERMISSION FROM LAND OWNER. REMOVED FENCES SHALL BE REINSTALLED TO A CONDITION THAT IS EQUAL TO OR BETTER THAN THE ORIGINAL, UNLESS OTHERWISE DIRECTED BY THE ATLANTIC RICHFIELD COMPANY.

7. TRAFFIC CONTROL:
A. GENERAL: CONSTRUCTION SHALL NOT COMMENCE ON THE PROJECT UNTIL NECESSARY CONSTRUCTION WARNING SIGNS AND TRAFFIC CONTROL ARE IN PLACE AND APPROVED BY THE ATLANTIC RICHFIELD COMPANY REPRESENTATIVE.
B. TRAFFIC PLAN: CONTRACTOR SHALL PREPARE AND SUBMIT FOR REVIEW BY ATLANTIC RICHFIELD COMPANY A TRAFFIC CONTROL PLAN. ALL TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
C. LOAD LIMITS: LEGAL LOAD LIMIT REQUIREMENTS SHALL BE ENFORCED ON ALL STATE HIGHWAYS, CITY STREETS, AND COUNTY ROADS.
D. THE MONTANA DEPARTMENT OF TRANSPORTATION SHALL REVIEW AND APPROVE ALL TRAFFIC CONTROL REQUIREMENTS ALONG HIGHWAY 1 ,HIGHWAY 48, AND HIGHWAY 441 (CRACKERVILLE HIGHWAY).
E. ANACONDA DEER LODGE COUNTY SHALL REVIEW AND APPROVE TRAFFIC CONTROL PLANS FOR THE STREETS PASSING THROUGH THE COMMUNITY OF OPPORTUNITY.

8. ATLANTIC RICHFIELD COMPANY HAS A PERMITTED WATER SOURCE ON OPPORTUNITY PONDS, THAT MAY BE USED BY THE CONTRACTOR. OTHER SOURCES ARE AVAILABLE AND MAY BE UTILIZED AT THE DISCRETION AND COST OF THE CONTRACTOR.

9. ANY DISTURBED PROPERTY, SECTION CORNERS, OR HIGHWAY MONUMENTS, PROPERTY PINS, OR OTHER MDT HIGHWAY CONTROL ARE TO BE RESET BY A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF MONTANA AT THE CONTRACTOR'S EXPENSE. THESE ITEMS ARE NOT SHOWN ON THE DRAWINGS.

10. ALL PERMITS REQUIRED TO PERFORM THE WORK SHALL BE ACQUIRED BY THE CONTRACTOR.

11. ALL EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.

SHEET INDEX

REVISION:

DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: N/A
DATUM: N/A
UNITS: N/A
SOURCE: N/A

SCALE IN FEET
0 NTS NTS

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

GENERAL NOTES
AND
SHEET INDEX

PIONEER
TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET
2

LEGEND

EXISTING - PLAN VIEW

- INDEX CONTOURS
- INTERMEDIATE CONTOURS
- ROADS
- RAILROADS
- CULVERTS
- x — FENCE
- OE — OVERHEAD ELECTRIC
- GAS — GAS LINE
- SS — SANITARY SEWER LINE
- DRAINAGE
- UE — UNDERGROUND ELECTRIC
- FIB — FIBER OPTIC LINE
- WTR — WATER LINE
- TEL — TELEPHONE LINE
- SD — STORM DRAIN LINE
- TV — BURIED TELEVISION LINE

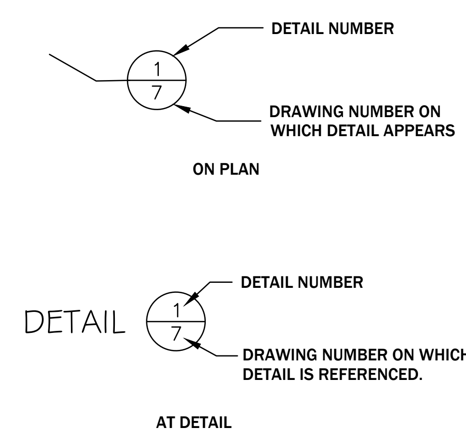
PROPOSED - PLAN VIEW/DETAILS

- 3 / 1 — SLOPE DESIGNATION
- SOD MAT
- TYPE A BORROW SOIL
- TYPE B BORROW SOIL
- AGGREGATE MIX NO. I
- AGGREGATE MIX NO. 2
- DECORATIVE AGGREGATE
- NATIVE MATERIAL

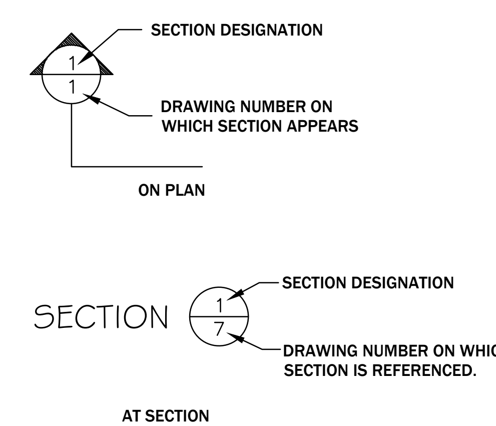
ABBREVIATIONS

ADLC	ANACONDA/DEER LODGE COUNTY
BM	BENCHMARK
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
COORD	COORDINATE
CP	SURVEY CONTROL POINT
DIA	DIAMETER
E	EAST
EL, ELEV	ELEVATION
EXIST	EXISTING
GRD	GROUND
H, HOR	HORIZONTAL
ID	INSIDE DIAMETER
IE, INV	INVERT ELEVATION
LF	LINEAR FEET (PLAN VIEW PROJECTION)
MAX	MAXIMUM
MIN	MINIMUM
N	NORTH
NE	NORTHEAST
N.T.S.	NOT TO SCALE
NW	NORTHWEST
O.C.	ON CENTER
OU	OPERABLE UNIT
RA	REMEDIAL ACTION
RD	REMEDIAL DESIGN
RCP	REINFORCED CONCRETE PIPE
REQ'D	REQUIRED
R.R.	RAILROAD
S	SOUTH
SCH	SCHEDULE
SE	SOUTHEAST
SHT	SHEET
SPECS	SPECIFICATIONS
STA	STATION
STD	STANDARD
SW	SOUTHWEST
TYP	TYPICAL
V, VERT	VERTICAL
W	WEST
W/	WITH
W/O	WITHOUT
WMA	WASTE MANAGEMENT AREA
X-SECT	CROSS SECTION

DETAIL INDICATOR



SECTION INDICATOR



NOTES:
ON PLANS: "–" SYMBOL IN UPPER HALF OF BUBBLE INDICATES GENERAL REFERENCE TO NOTED DRAWING NUMBER.
AT DETAIL/SECTIONS: "–" SYMBOL (NO DRAWING NUMBER) IN LOWER HALF OF BUBBLE INDICATES DETAIL/SECTION IS REFERENCED ON MORE THAN ONE DRAWING.

REVISION: DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: N/A
DATUM: N/A
UNITS: N/A
SOURCE: N/A

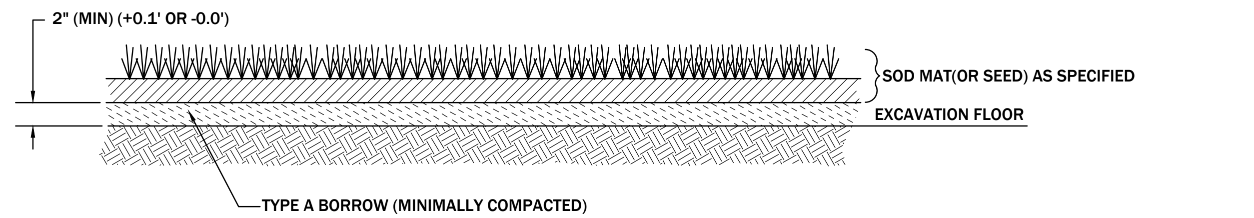
SCALE IN FEET
0 NTS NTS

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

LEGEND AND ABBREVIATIONS

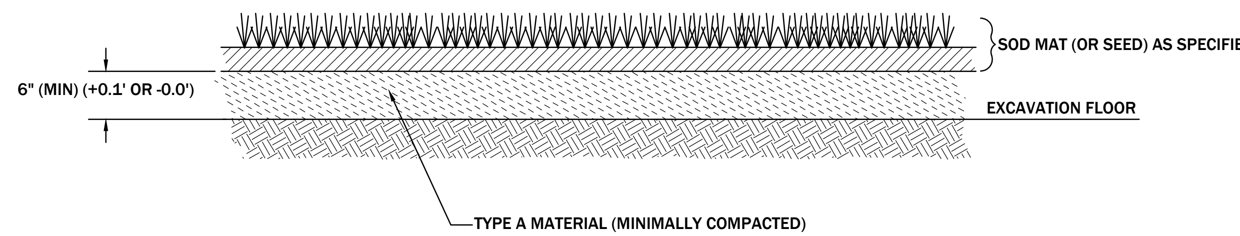
PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET 3



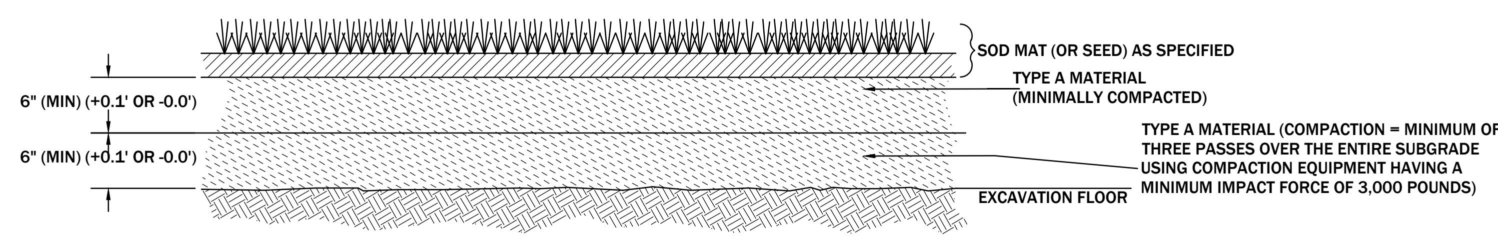
2" SOIL AND SOD OR SEED REMOVAL/REPLACEMENT (Y2) (Y2*) DETAIL 1 / — —

NOTE: EXCAVATION DEPTH BELOW EXISTING SOD LAYER = 2" (MIN) (+0.1' OR -0.0')



6" SOIL AND SOD OR SEED REMOVAL/REPLACEMENT (Y6) (Y6*) DETAIL 2 / — —

NOTE: EXCAVATION DEPTH BELOW EXISTING SOD LAYER = 6" (MIN) (+0.1' OR -0.0')



12" SOIL AND SOD OR SEED REMOVAL/REPLACEMENT (Y12) (Y12*)DETAIL 3 / — —

NOTE: EXCAVATION DEPTH BELOW EXISTING SOD LAYER = 12" (MIN) (+0.1' OR -0.0')

REVISION: DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: NA
DATUM:
UNITS:
SOURCE:

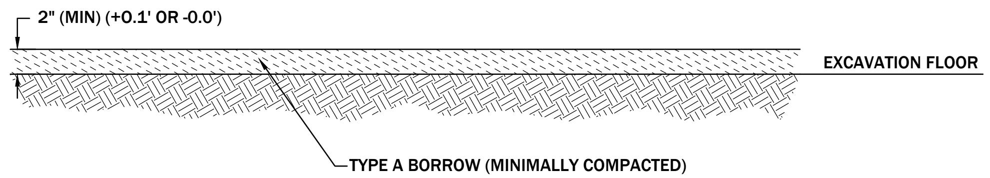
SCALE IN FEET
0 NA

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

LAWN/YARD
REMOVAL/
REPLACEMENT
DETAILS

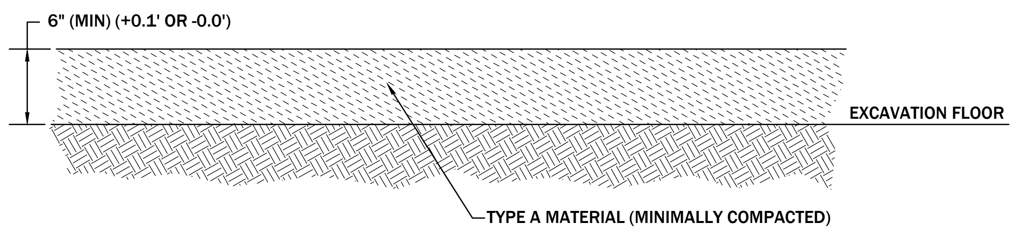
PIONEER
TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET
4



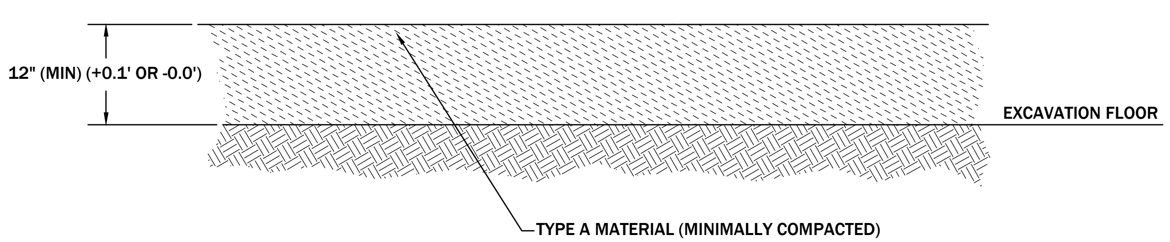
2" GARDEN SOIL REMOVAL/REPLACEMENT (G2) DETAIL
4
— —

NOTE: EXCAVATION DEPTH BELOW EXISTING GROUND SURFACE = 2" (MIN) (+0.1' TO -0.0')



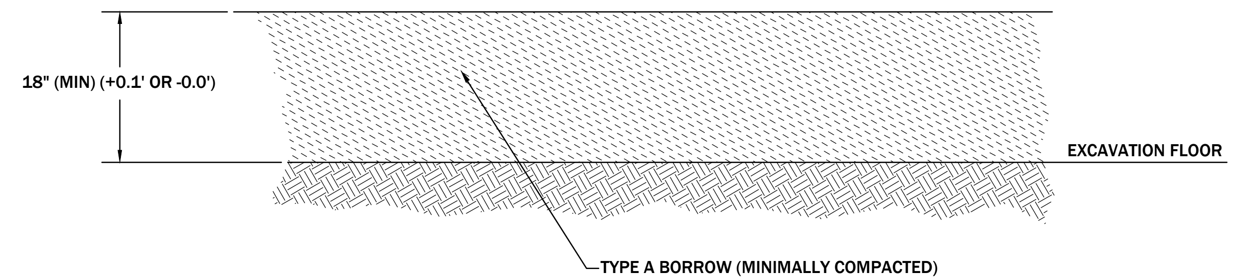
6" GARDEN SOIL REMOVAL/REPLACEMENT (G6) DETAIL
5
— —

NOTE: EXCAVATION DEPTH BELOW EXISTING GROUND SURFACE = 6" (MIN) (+0.1' OR -0.0')



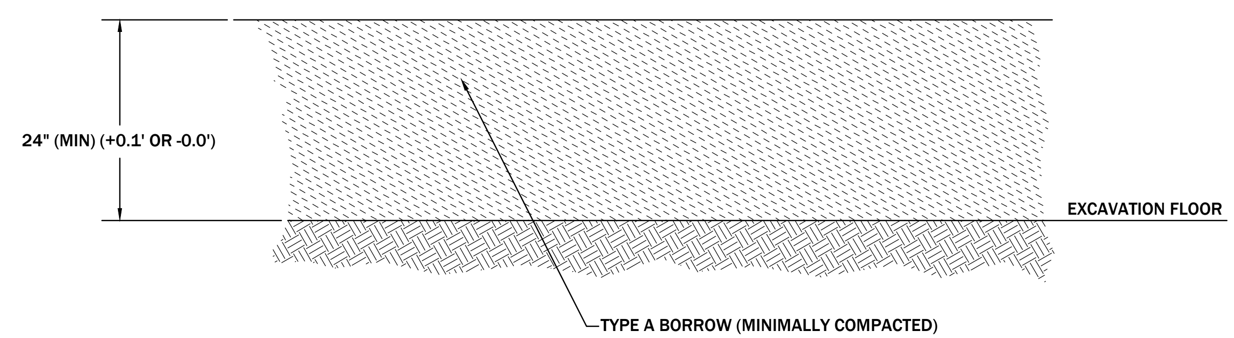
12" GARDEN SOIL REMOVAL/REPLACEMENT (G12) DETAIL
6
— —

NOTE: EXCAVATOIN DEPTH BELOW EXISTING GROUND SURFACE = 12" (MIN) (+0.1' OR -0.0')



18" GARDEN SOIL REMOVAL/REPLACEMENT (G18) DETAIL
7
— —

NOTE: EXCAVATOIN DEPTH BELOW EXISTING GROUND SURFACE = 18" (MIN) (+0.1' OR -0.0')



24" GARDEN SOIL REMOVAL/REPLACEMENT (G24) DETAIL
8
— —

NOTE: EXCAVATOIN DEPTH BELOW EXISTING GROUND SURFACE = 18" (MIN) (+0.1' OR -0.0')

REVISION:

DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: N/A
DATUM: N/A
UNITS: N/A
SOURCE: N/A

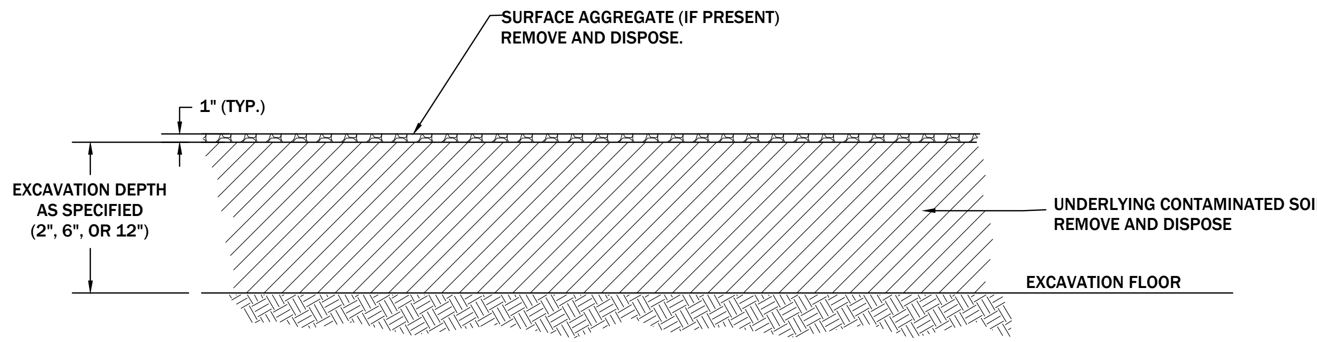
SCALE IN FEET
0 NTS NTS

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

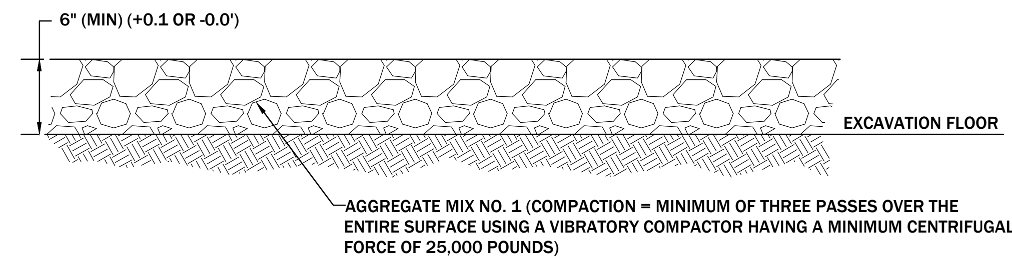
GARDEN SOIL REMOVAL/ REPLACEMENT DETAILS

PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

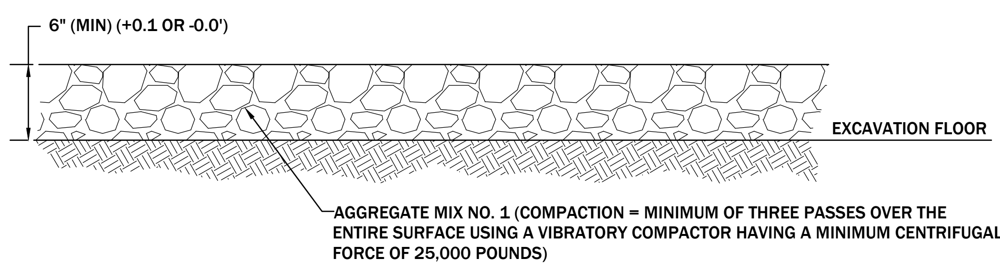
SHEET
5



GENERAL EARTHEN DRIVEWAY REMOVAL DETAIL 9
— —

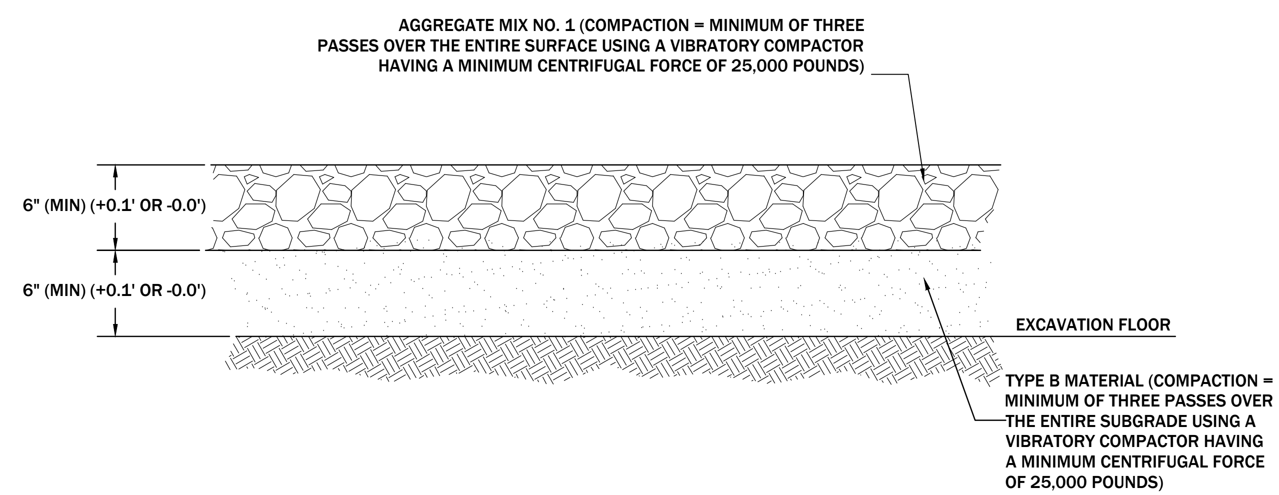


6" EARTHEN DRIVEWAY/ALLEY REPLACEMENT (E6/A6) DETAIL 11
— —



2" EARTHEN DRIVEWAY REPLACEMENT (E2) DETAIL 10
— —

NOTE: ACTUAL EXCAVATION DEPTH FOR EARTHEN DRIVEWAYS = 6" (MIN) (+0.1' OR -0.0')



12" EARTHEN DRIVEWAY REPLACEMENT (E12) DETAIL 12
— —

REVISION: DATE:	BY:	DESC:
9-1-13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: NA
DATUM:
UNITS:
SOURCE:

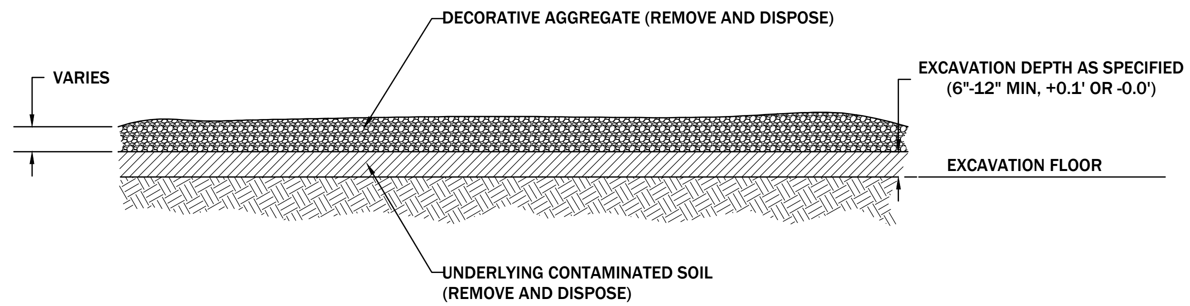
SCALE IN FEET
0 NA

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

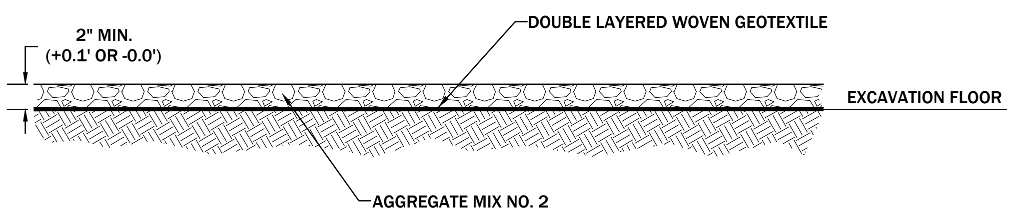
EARTHEN DRIVEWAYS AND ALLEYS REMOVAL/ REPLACEMENT DETAILS

PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

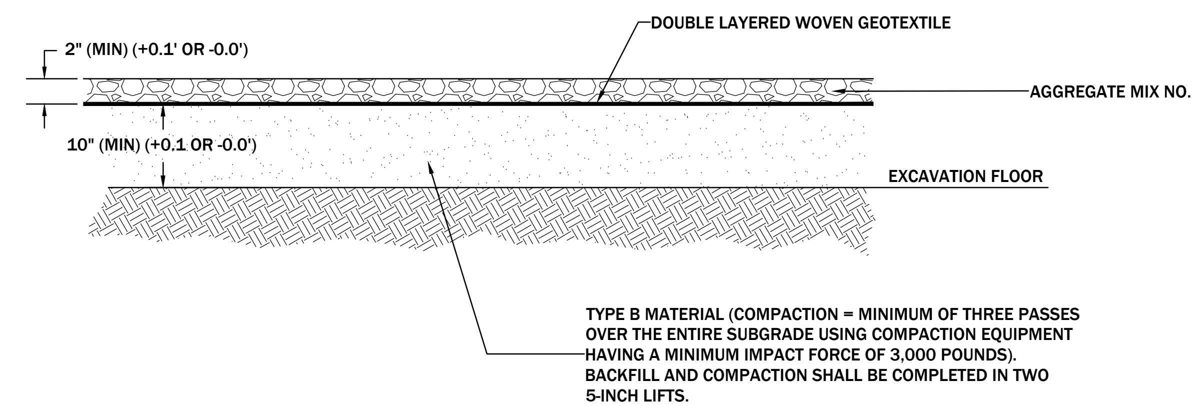
SHEET
6



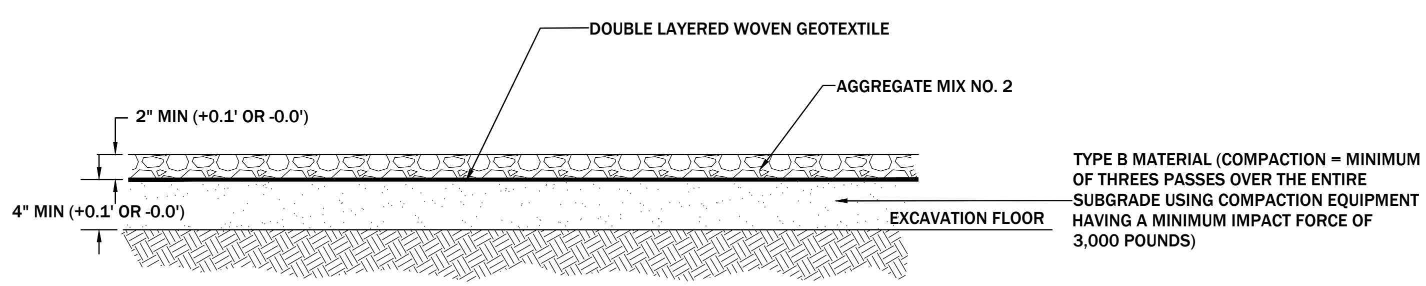
GENERAL ROCK GARDEN REMOVAL DETAIL 13 / --



2" ROCK GARDEN REPLACEMENT (R2) DETAIL 14 / --



12" ROCK GARDEN REPLACEMENT (R12) DETAIL 16 / --



6" ROCK GARDEN REPLACEMENT (R6) DETAIL 15 / --

REVISION: DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: N/A
DATUM: N/A
UNITS: N/A
SOURCE: N/A

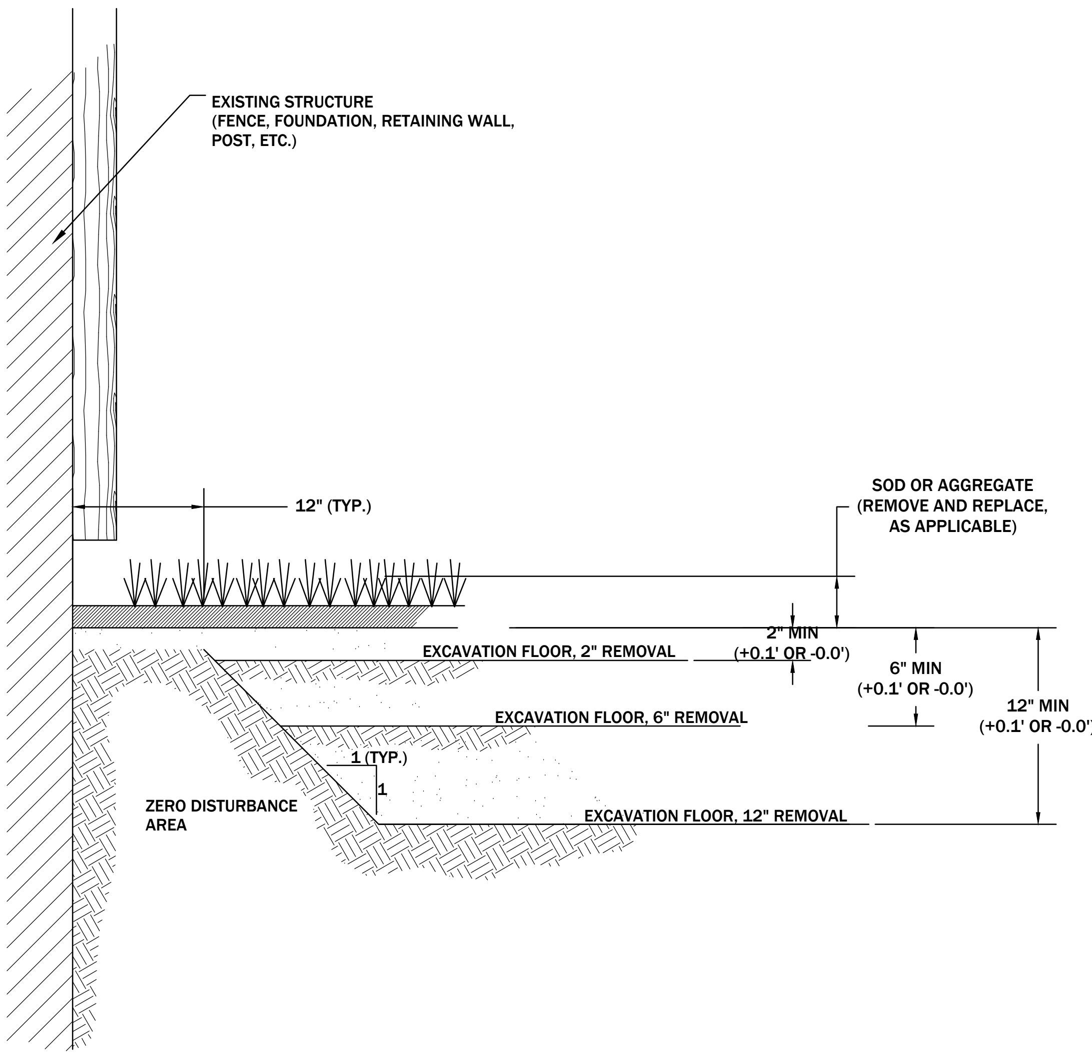
SCALE IN FEET
0 NTS NTS

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

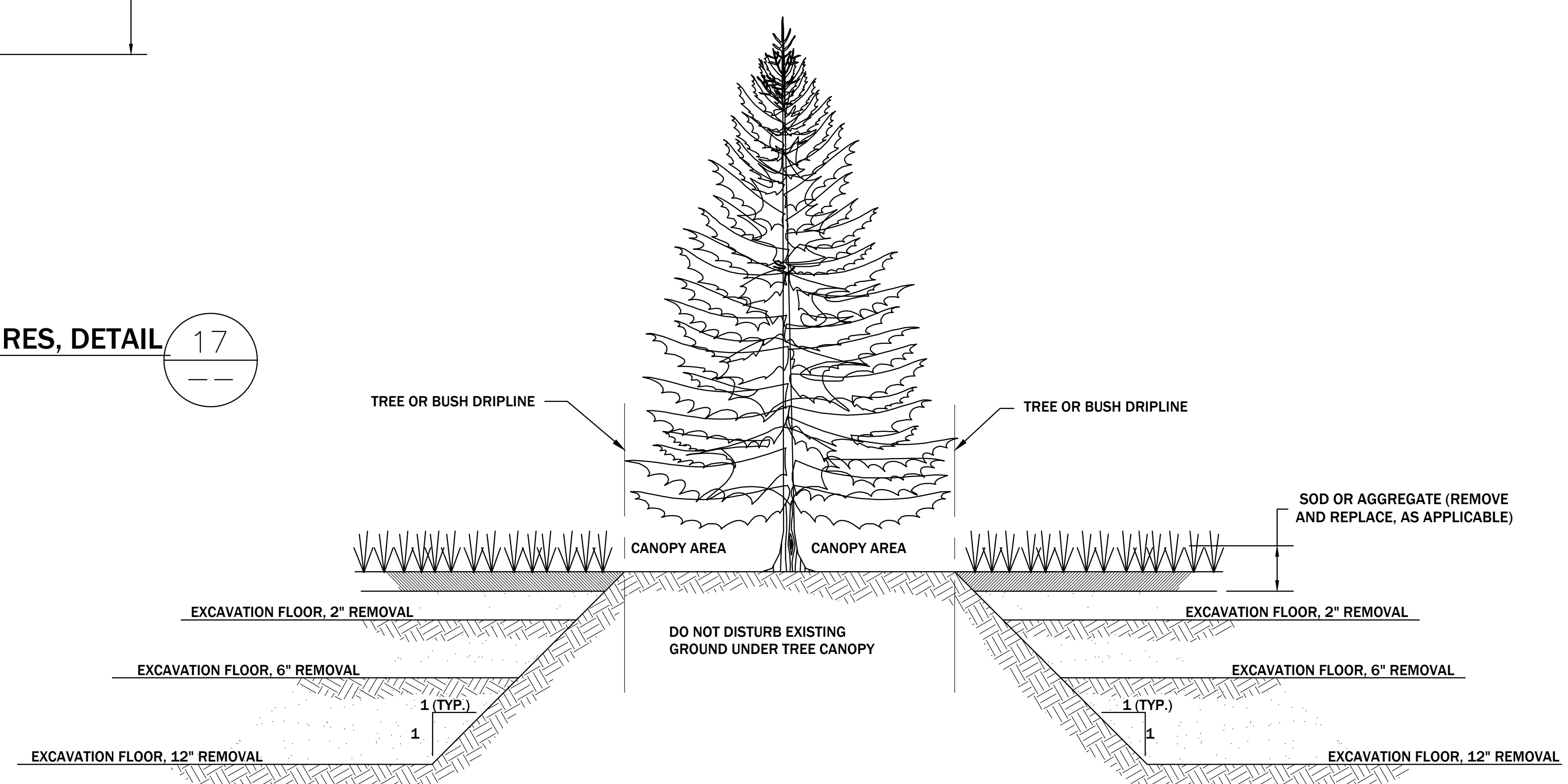
ROCK GARDEN
REMOVAL/
REPLACEMENT
DETAILS

PIONEER
TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET
7



EXCAVATION NEAR EXISTING STRUCTURES, DETAIL 17 / — —



DEPTH TOLERANCE AS INDICATED ON DETAIL 17 / 8

EXCAVATION NEAR EXISTING TREES, BUSHES, AND SHRUBS, DETAIL 18 / — —

REVISION: DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: N/A
DATUM: N/A
UNITS: N/A
SOURCE: N/A

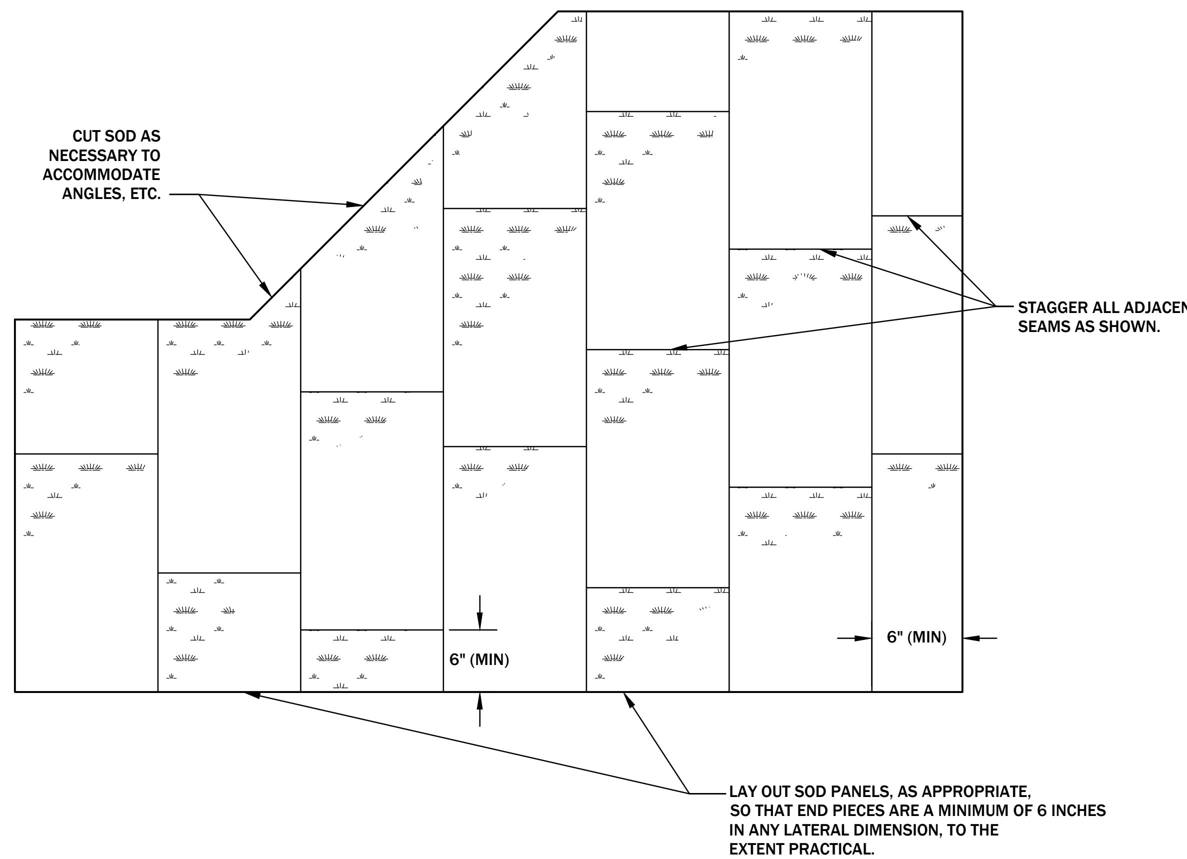
SCALE IN FEET
0 NTS NTS

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

REMOVAL NEAR OBSTACLES DETAILS

PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET
8



PLAN VIEW OF SOD PANEL LAYOUT DETAIL

19
— —

REVISION: DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: N/A
DATUM: N/A
UNITS: N/A
SOURCE: N/A

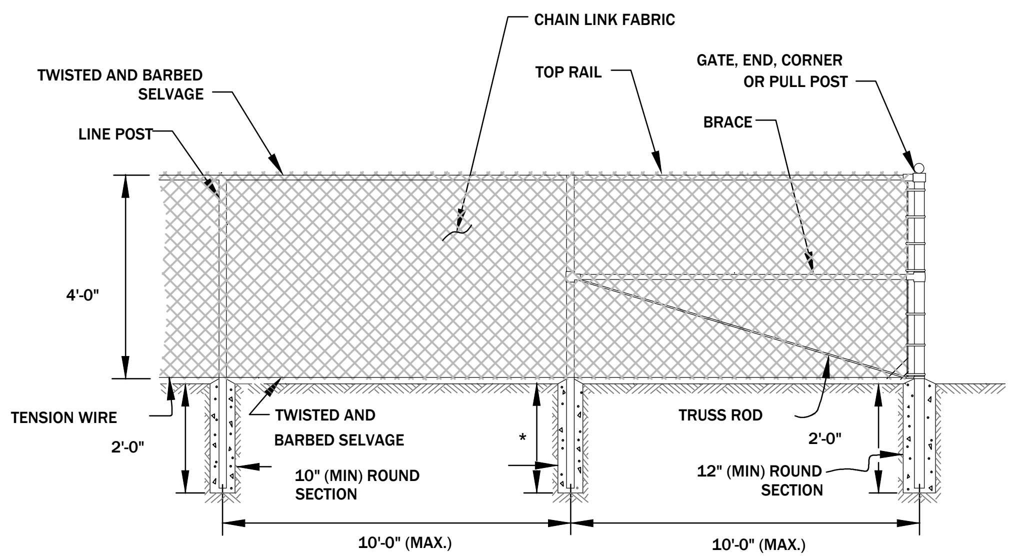
SCALE IN FEET
0 NTS NTS

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

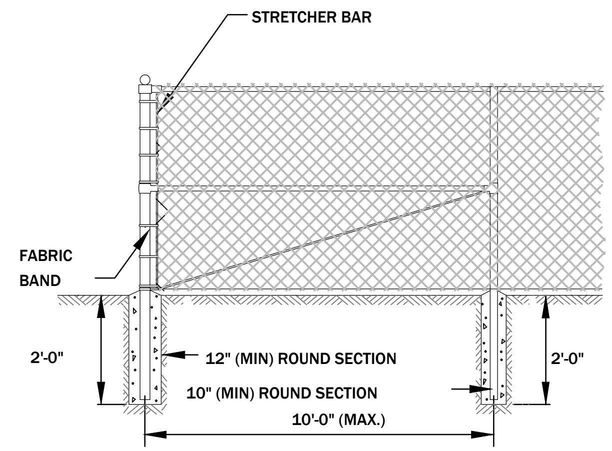
SOD INSTALLATION DETAILS

PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

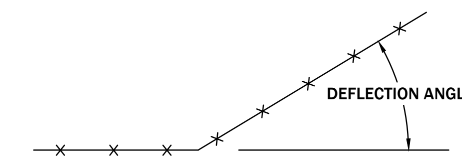
SHEET
9



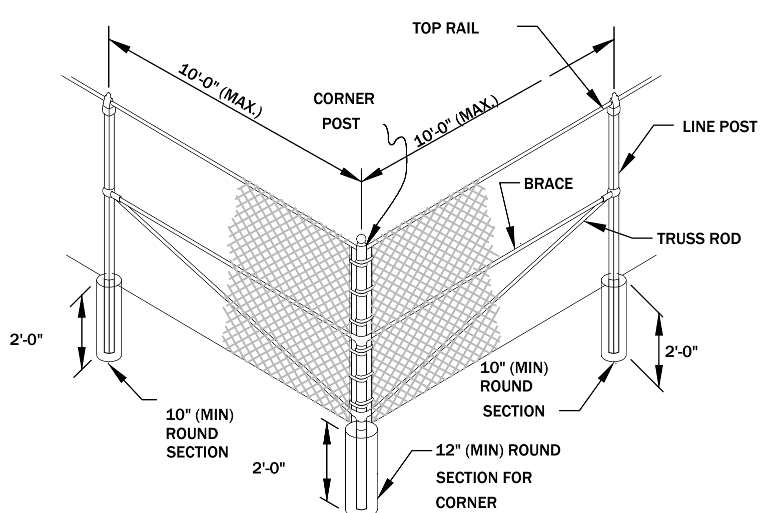
CHAIN LINK FENCE



SINGLE PANEL

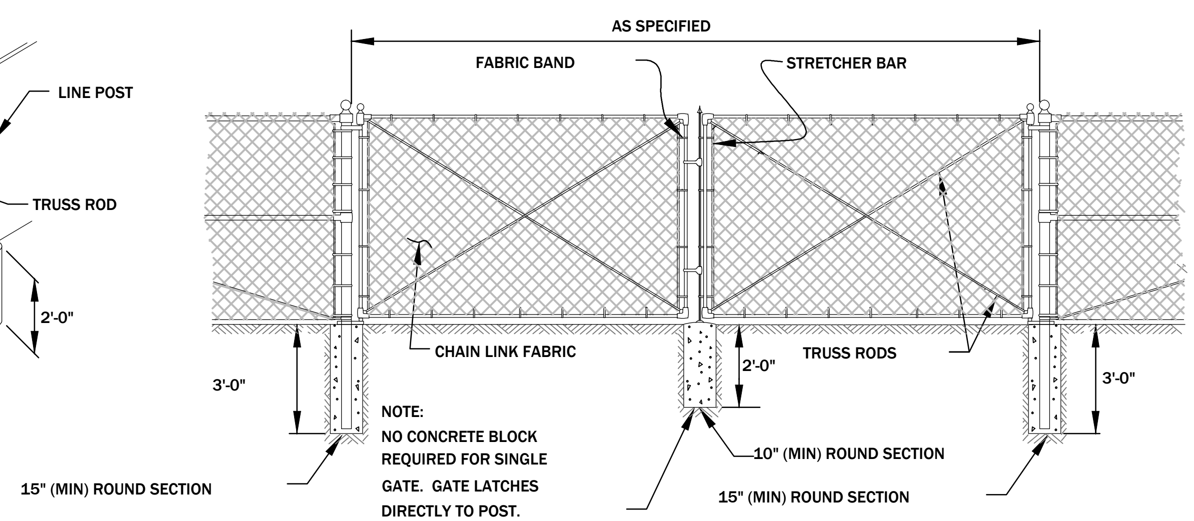


NOTES:
1. SEE THE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
2. INSTALL DOUBLE PANELS AT 300' MAXIMUM SPACING AND AT ALL FENCE CORNERS WITH DEFLECTION ANGLES GREATER THAN 10°.
3. PULL POST BRACING IS THE SAME AS CORNER BRACING.
4. A DROP BAR LOCKING DEVICE IS REQUIRED FOR ALL DOUBLE GATE INSTALLATIONS. THE DROP BAR MUST BE ABLE TO BE INSERTED INTO THE CONCRETE BLOCK AT LEAST SIX INCHES.



DOUBLE PANEL

PULL POST AND CORNER POST BRACING



GATES

CHAIN LINK FENCE DETAILS

20

REVISION:

DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: N/A
DATUM: N/A
UNITS: N/A
SOURCE: N/A

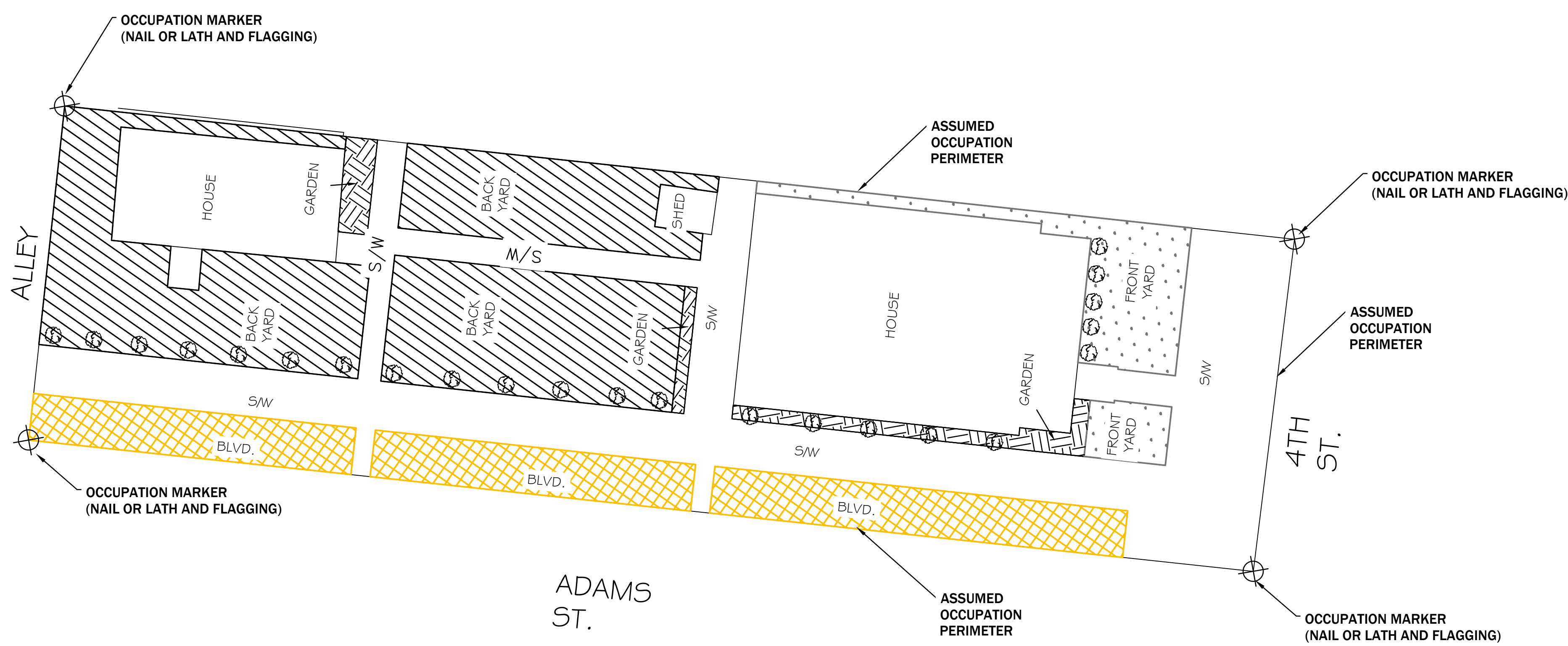
SCALE IN FEET
0 NTS NTS

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

CHAIN LINK FENCE DETAILS

PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET
10



NOTE:
BOUNDARIES ON THIS SITE WORK PLAN DO NOT REPRESENT A LEGAL SURVEY. THESE BOUNDARIES ARE TO BE USED FOR GENERAL REFERENCE ONLY. NO LIABILITY IS ASSUMED BY ATLANTIC RICHFIELD COMPANY.

EXAMPLE RESIDENTIAL OCCUPATION MARKERS

21
— —

REVISION:

DATE:	BY:	DESC:
9/1/13	JHD	CL/OP BID PACKAGE
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: CLA
DESIGNED BY: SDB
CHECKED BY: SDB
APPROVED BY: TWH
PROJECT NO: 13018
DATE: 7/23/09

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD 83
UNITS: FEET
SOURCE: PIONEER

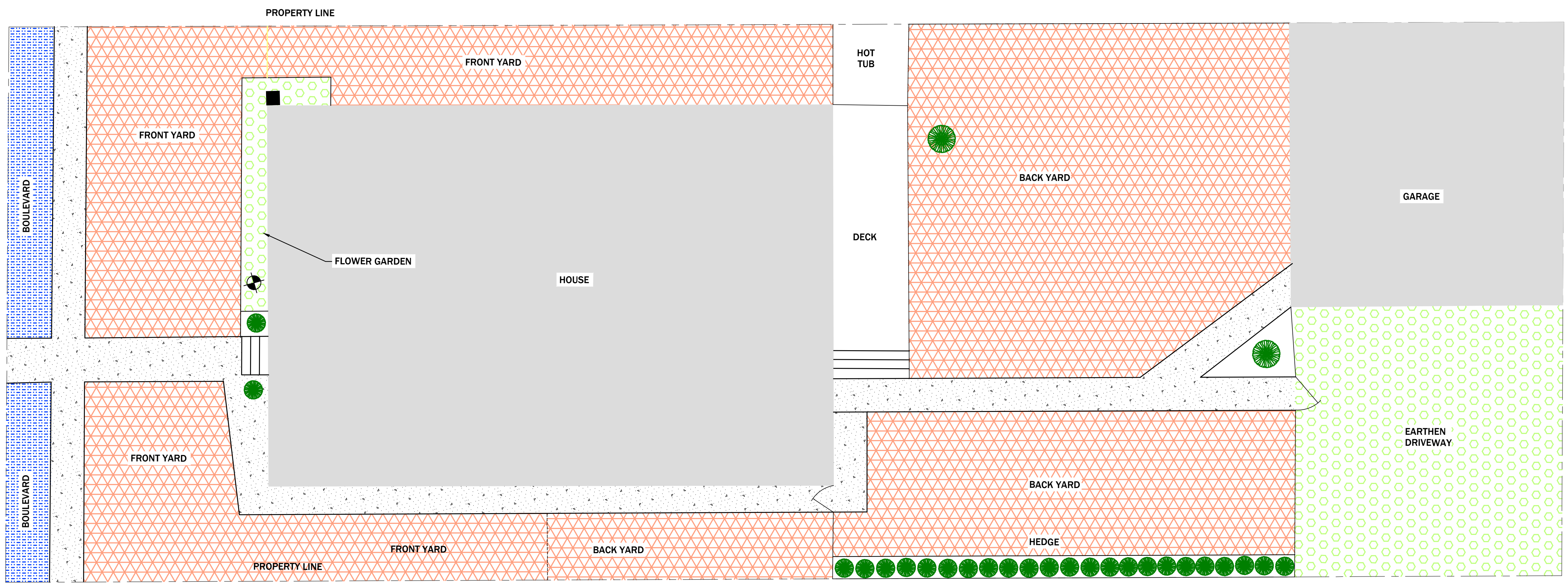
SCALE IN FEET
0 10 20

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

EXAMPLE
RESIDENTIAL
OCCUPATION
MARKERS

PIONEER
TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET
11



RESIDENTIAL YARD COMPONENTS	COMPONENT SURFACE AREA (square feet)	COMPONENT ARSENIC RESULTS (mg/kg)					COMPONENT LEAD RESULTS (mg/kg)					ESTIMATED QUANTITIES			
		0"-2" Weighted Average = 253.7 mg/kg	2"-6" Weighted Average = 346.4 mg/kg	6"-12" Weighted Average = 192.3 mg/kg	12"-18" Weighted Average = 215.0 mg/kg	18"-24" Weighted Average = 117.0 mg/kg	0"-2"	2"-6"	6"-12"	12"-18"	18"-24"	EXCAVATION (cubic yards)	GENERAL BACKFILL (cubic yards)	SOD (square feet)	AGGREGATE MIX NO. 1 (cubic yards)
BOULEVARD (BV)	184	465	150	255	N/A	N/A	191	248	315	N/A	N/A	1.1	1.1	184	-
FRONT YARD (FY)	1,154	112	251	137	N/A	N/A	255	512	313	N/A	N/A	21.4	21.4	1,154	-
FLOWER GARDEN (FG)	66	343	138	315	215	117	117	412	582	313	290	12.7	12.7	-	-
BACK YARD (BY)	1,701	393	452	220	N/A	N/A	785	337	341	N/A	N/A	31.5	31.5	1,701	-
EARTHEN DRIVE (ED)	576	240	233	187	N/A	N/A	337	375	482	N/A	N/A	21.3	10.7	-	10.7
TOTAL	3,681											88.0	77.4	3,039	10.7
	COMPOSITE ARSENIC WEIGHTED AVERAGE CONCENTRATION AND COMPONENT ARSENIC CONCENTRATION IS ≥ 250 mg/kg														
	COMPOSITE ARSENIC WEIGHTED AVERAGE CONCENTRATION IS ≥ 250 mg/kg														
	COMPONENT LEAD CONCENTRATION IS ≥ 400 mg/kg														

EXAMPLE ISWP 22

NOTES:
1. CONTRACTOR SHALL LOCATE ALL UNDERGROUND UTILITIES, AND SHALL PROTECT UTILITIES FROM DAMAGE DURING CONSTRUCTION.
2. CONTRACTOR SHALL REMOVE FENCE(S) AS REQUIRED TO ALLOW EFFICIENT ACCESS TO THE WORK AREA(S). ALL REMOVED FENCES AND/OR GATES SHALL BE REPLACED WITH IDENTICAL OR SIMILAR FENCE/GATE MATERIALS AS APPROVED BY THE LANDOWNER AND AERL.
3. WORK SCHEDULE SHALL BE APPROVED BY THE ENGINEER AND THE LANDOWNER A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION.
4. MOISTURE CONDITION AND COMPACT EXCAVATION FLOOR (SUBGRADE) IN DRIVEWAY AREA, AS APPROPRIATE, TO ASSURE THAT OVERLYING BACKFILL EMBANKMENT WILL ATTAIN THE COMPACTION SPECIFICATION.
5. COMPACT GENERAL BACKFILL EMBANKMENT IN DRIVEWAY AREA (MAX. 6" LIFTS) TO ATTAIN 95% OF STANDARD PROCTOR DENSITY AT ±3% OF OPTIMUM MOISTURE CONTENT.
6. COMPACT CRUSHED TOP SURFACING MATERIAL (AGGREGATE MIX NO. 1) IN DRIVEWAY AREA TO ATTAIN 95% OF STANDARD PROCTOR DENSITY AT ±3% OF OPTIMUM MOISTURE CONTENT.
7. ALL EXCAVATED MATERIALS SHALL BE DISPOSED AT THE DESIGNATED WMA.
8. LANDOWNER ACKNOWLEDGES ITS RESPONSIBILITY TO PROPERLY WATER AND MAINTAIN SOD AND/OR SEEDED COVER.

LEGEND
- NO ACTION REQUIRED
- REMOVE TO 2" DEPTH
- REMOVE TO 6" DEPTH
- REMOVE TO 12" DEPTH
- REMOVE TO 18" DEPTH
- REMOVE TO 24" DEPTH

REVISION:

DATE:	BY:	DESC:
1/14/15	JHD	CSOU RAWP/FDR

DRAWN BY: BJM
DESIGNED BY: SDB
CHECKED BY: .
APPROVED BY: .
PROJECT NO: 4569
DATE: 11/8/01

DISPLAYED AS:
COORD SYS/ZONE: NA
DATUM: NA
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
0 5 10

ATLANTIC RICHFIELD COMPANY
COMMUNITY SOILS OPERABLE UNIT
RESIDENTIAL SOILS RAWP/FDR

EXAMPLE
INDIVIDUAL SITE
WORK PLAN (ISWP)

PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA 59711
307 E. PARK AVE., SUITE 421
(406) 563-9371

SHEET
12

APPENDIX E

RESIDENTIAL SOILS/DUST QUALITY ASSURANCE PROJECT PLAN (QAPP)

ANACONDA SMELTER NPL SITE
COMMUNITY SOILS OPERABLE UNIT

Final

Residential Soils/Dust
Quality Assurance Project Plan (QAPP)

Atlantic Richfield Company

August 7, 2015

ANACONDA SMELTER NPL SITE
COMMUNITY SOILS OPERABLE UNIT

Final

Residential Soils/Dust
Quality Assurance Project Plan (QAPP)

Prepared for:

Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Prepared by:

Pioneer Technical Services, Inc.
307 East Park Street, Suite 421
Anaconda, Montana 59711

August 7, 2015

APPROVAL PAGE

Quality Assurance Project Plan for CS OU Residential Soils/Dust Remedial Action Anaconda Smelter NPL Site

Approved: ______________________________ Date: ____________
Charles Coleman, Site Project Manager, EPA, Region 8

Approved: ______________________________ Date: ____________
Joel Chavez, Project Officer, Montana DEQ

Approved: ______________________________ Date: ____________
Luke Pokorny, Project Manager
Atlantic Richfield Company

Approved: ______________________________ Date: ____________
Terry Moore, Quality Assurance Manager
Atlantic Richfield Company

Plan is effective on date of approval.

DISTRIBUTION LIST

Anaconda Smelter NPL Site
Quality Assurance Project Plan (QAPP)
Anaconda-Deer Lodge County, Montana

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address
Charles Coleman	Remedial Project Manager	EPA	(406) 457-5038	Coleman.Charles@epa.gov
Julie DalSoglio	Director EPA Region 8	EPA	(406) 457-5025	Dalsoglio.julie@Epa.gov
Joe Vranka	Superfund Branch Chief	EPA	(406) 457-5021	vranka.joe@epa.gov
Andy Lensink	Senior Attorney for Mining	EPA	(303) 312-6908	lensink.andy@epa.gov
Joel Chavez	State Project Officer	DEQ	(406) 444-2251	jchavez@mt.gov
Katherine Haque-Hausrath	Attorney	DEQ	(406) 841-5019	khaquehausrath@mt.gov
Ken Brockman	Civil Engineer	USBR	(406) 565-0383	kbrockman@usbr.gov
Gunnar Emilsson	EPA Contractor	CDM Smith	(406) 441-1422	emilssonGR@cdm.com
Connie Ternes-Daniels	Chief Executive	ADLC	(406) 563-4000	ctdaniels@anacondadeerlodge.mt.gov
Carl Nyman	Superfund Coordinator	ADLC	(406) 560-4200	cnyman@qwestoffice.net
Luke Pokorny	Project Manager	Atlantic Richfield	(406) 782-9964	luke.pokorny@bp.com
Ron Halsey	Operations Manager	Atlantic Richfield	(714) 670-5331	ronald.halsey@bp.com
Cord Harris	Life Cycle Manager	Atlantic Richfield	(714) 670-3903	cord.harris@bp.com
Terry Moore	Senior Technology Specialist	Atlantic Richfield	(214) 505-3992	terry.moore@bp.com
Jill Kelley	Atlantic Richfield Legal	Atlantic Richfield	(630) 580-9575	Jill.Kelley@bp.com
John Davis	Atlantic Richfield Legal Contractor	Poore, Roth and Robinson	(406) 497-1200	jpd@prrlaw.com
Don Booth	Atlantic Richfield Contractor	Booth Consulting	(406) 579-5455	donbooth10@gmail.com
Shawn Bisch	Atlantic Richfield Contractor	Pioneer Technical Services, Inc.	(406) 563-9371	sbisch@pioneer-technical.com
Jesse Schwarzrock	Atlantic Richfield Contractor	Pioneer Technical Services, Inc.	(406) 563-9371	jschwarzrock@pioneer-technical.com

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REVISION SUMMARY

Revision No.	Author	Version	Description	Date
Rev 0	Jesse Schwarzrock	Draft	Issued for Atlantic Richfield Review	April 1, 2015
Rev 1	Jesse Schwarzrock	Draft Final	Issued for Agency Review	May 1, 2015
Rev 2	Jesse Schwarzrock	Final	Issued for Agency Review	August 7, 2015

LIST OF ACRONYMS AND ABBREVIATIONS

ADLC	Anaconda-Deer Lodge County
Atlantic Richfield	Atlantic Richfield Company
AWA	Area-Weighted Average
Bgs	Below Ground Surface
CAR	Corrective Action Report
CCB	Continuing Calibration Blank
CCV	Continuing Calibration Verification
CFRSSI	Clark Fork River Superfund Site Investigations
CLP	Contract Laboratory Program
COC	Constituent of Concern
CPM	Contractor Project Manager
CPMP	Community Protective Measures Program
CS	Community Soils
DEQ	Montana Department of Environmental Quality
DIAR	Data Interpretation and Analysis Report
DPS	Development Permit System
DQA	Data Quality Assessment
DQO	Data Quality Objectives
DSR	Data Summary Report
EDD	Electronic Data Deliverable
EPA	U.S. Environmental Protection Agency
FDR	Final Design Report
GIS	Geographical Information System
GPS	Global Positioning System
GUS	General Utility and Service
HHRA	Human Health Risk Assessment
ICP-AES	Inducted Coupled Plasma Atomic Emission Spectroscopy
ICs	Institutional Controls
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
IM	Integrity Management
ISWP	Individual Site Work Plan
LaMP	Laboratory Management Program
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MDL	Method Detection Limit
mg/kg	milligram per kilogram
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NLLAP	National Lead Laboratory Accreditation Program
NPL	National Priorities List

OU	Operable Unit
Ppm	parts per million
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QMP	Quality Management Plan
RA	Remedial Action
RAWP	Remedial Action Work Plan
RD	Remedial Design
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SAP	Sampling Analysis Plan
SOP	Standard Operating Procedure
SPAOD	Superfund Planning Area Overlay District
SSHASP	Site-Specific Health and Safety Plan
µm	Micron
$\mu g/ft^2$	micrograms per square foot
ºC	degrees Celsius

1.0 INTRODUCTION

The purpose of this Quality Assurance Project Plan (QAPP) is to provide guidance for residential soil and attic dust sampling and analysis withinthe Community Soils Operable Unit (CS OU) of the Anaconda Smelter National Priorities List (NPL) Site and to describe the Quality Assurance/Quality Control (QA/QC) policies and procedures to be used during data collection and analyses. This QAPP was prepared in a manner consistent with the *EPA Requirements for Quality Assurance Project Plans (QA/R-5)*. (EPA 2001), the *Uniform Federal Policy for Quality Assurance Project Plans: Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs* (EPA, 2005) and the forthcoming Anaconda Smelter National Priorities List (NPL) Site Quality Management Plan (QMP). This QAPP includes the following four key elements:

- Project management and objectives;
- Measurement and data acquisition;
- Assessment and oversight; and
- Data review.

The sections below provide the project elements and include the appropriate content needed for planning, sampling, and analyses within the site. The sections in this QAPP expand or reference information in other site-wide documents to comply with the *Uniform Federal Policy for Quality Assurance Project Plans: Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs* (EPA, 2005) and to present project-specific requirements.

2.0 PROJECT MANAGEMENT

This section addresses project administrative functions as well as project background, objectives, and documentation requirements for sampling and analyses activities on the site.

2.1 Project Organization and Responsibilities

An organizational chart showing the overall organization of the project team is provided as Figure 1. Responsibilities of key individuals comprising the project team and their detailed responsibilities are listed below.

<u>Atlantic Richfield Project Manager (Atlantic Richfield PM)</u>
The Atlantic Richfield PM monitors the performance of the contractor(s), consults with the Contractor Project Manager and Contractor QA Officer on deficiencies, and aids in finalizing resolution actions.

<u>Atlantic Richfield Quality Assurance Manager (Atlantic Richfield QA Manager)</u>
The Atlantic Richfield QA Manager interfaces with the Atlantic Richfield PM for company policies regarding quality and has the authority and responsibility to approve QA documents specific to the project including this QAPP. The QA Manager functions independently from the project team generating the data.

Contractor Project Manager (CPM)
The CPM is responsible for scheduling all sampling work to be completed and ensures that the work is performed in accordance with the requirements contained herein. The CPM is also responsible for consulting with the Contractor QA Officer regarding any project deficiencies and resolutions.

Contractor Quality Assurance Officer
The Contractor QA Officer is responsible for verifying effective implementation of QAPP requirements and procedures including reviewing field and laboratory data and evaluating data quality.

Field Team Leader
The Field Team Leader ensures that the QAPP has been reviewed by all members of the field team and is properly followed during field activities. The Field Team Leader will conduct daily safety meetings, assist in field activities, and document activities in the field logbook.

The Field Team Leader is responsible for facilitating field activities, managing equipment, and problem solving and decision making in the field. The Field Team Leader is responsible for technical aspects of the project and provides "on-the-ground" overview of project implementation by observing site activities to ensure compliance with technical project requirements, and the Site-Specific Health and Safety Plan (SSHASP). The Field Team Leader is responsible for identifying potential Integrity Management (IM) issues during field activities and reporting any and all issues to the Contractor QA Officer.

Safety and Health Manager
The Safety and Health Manager is responsible for developing and reviewing the SSHASP with all members of the field team. In addition, the Safety and Health Manager will lead applicable Task Risk Assessments and conduct the initial safety meeting prior to starting fieldwork. The Safety and Health Manager will ensure that work crews comply with all site health and safety requirements and will revise the SSHASP, if necessary.

Contract Laboratory
As detailed in the QMP, Atlantic Richfield maintains a Laboratory Management Program (LaMP) that ensures analytical testing service needs are consistently met. The LaMP consists of a network of approved contract laboratories that supply analytical testing services for Atlantic Richfield's environmental and remediation programs. Organizations performing environmental analyses for Atlantic Richfield will demonstrate their qualifications per the LaMP prior to acceptance as a LaMP laboratory. If a laboratory's participation in the LaMP is suspended or revoked at any time during the period of performance, the Atlantic Richfield PM will be notified immediately to ensure any potential impact to the scope of work being performed is addressed accordingly. The contract laboratory's responsibility is to ensure its QA Personnel are familiar with the approved QAPP and are performing the analytical and QC work as specified per laboratory methods and this QAPP. Contract Laboratory QA Personnel are responsible for reviewing final analytical reports produced by the laboratory, coordinating the laboratory analyses schedule and supervising in-house chain of custody procedures.

2.2 Problem Definition and Background

The CS OU is located in southwest Montana in and around the city of Anaconda. Mining and smelting activities were conducted for nearly 100 years in Anaconda and the surrounding areas, resulting in the contamination of soils, surface water and groundwater. This contamination was spread primarily through airborne emissions and waste disposal practices from smelting operations.

This QAPP was developed in response to the U. S. Environmental Protection Agency's (EPA) and Montana Department of Environmental Quality (DEQ) (the Agencies) 2013 CS OU *Record of Decision (ROD) Amendment* (CS OU ROD Amendment), which amended the original 1996 CS OU ROD (EPA, 1996). The CS OU ROD Amendment (EPA/DEQ, 2013) added a lead action level for residential soils (in addition to the pre-existing arsenic action level) as well as lead and arsenic action levels for attic dust.

This QAPP details both lead and arsenic sampling procedures applicable to residential soils and attic dust within the Anaconda-Deer Lodge County (ADLC) Superfund Planning Area Overlay District (SPAOD– [Figure 2]). For residential soils, this QAPP addresses lead remedial action (RA) on a yard component-specific (e.g., front yard, back yard, garden, etc.) basis and arsenic based primarily on area-weighted average (AWA) calculations.

Due to the additional requirements of the CS OU ROD Amendment (EPA/DEQ, 2013), an updated CS OU Sampling and Analysis Plan (SAP) is needed. This QAPP will function as the CS OU SAP for all future CS OU sampling activities.

2.3 Project Description and Schedule

The purpose of this QAPP is to address arsenic and lead impacts in residential soils and attic dust within the CS OU area of concern (ADLC SPAOD). This investigation will supplement the original CS OU sampling investigation and RA activities that focused on arsenic in residential soils by adding a lead action level for residential soils as well as lead and arsenic action levels for attic dust. Based on the results of sampling completed under this QAPP, additional RA will be applied, as appropriate.

The objectives of the QAPP are as follows:

1. Provide a sampling and analysis program for CS OU sampling activities (soil and attic dust) and ensure compliance with performance standards; and
2. Provide data to determine the scope of future CS OU RA.

Implementation of this QAPP will begin with CS OU sampling activities in the fall of 2015 in anticipation of RA activities beginning in 2016. The CS OU project schedule information is located in Table 1.

2.4 Quality Objectives and Criteria

This section discusses the internal QC and review procedures used to ensure that all data collected for this project are of known quality.

Development of Data Quality Objectives (DQOs) was completed in accordance with the EPA's *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006). The DQOs are statements that define the type, quality, quantity, purpose, and use of data to be collected. The EPA has developed a seven-step process for establishing DQOs to help ensure that data collected during a field sampling program are adequate to support reliable site-specific decision making (EPA, 2001 and 2006). The following section outlines and establishes the QAPP DQOs.

2.4.1 Data Quality Objectives

The DQOs process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps of which the output from each step influences the choices that will be made later in the process. These steps include:

- Step 1: State the Problem;
- Step 2: Identify the Decision;
- Step 3: Identify the Inputs to the Decision;
- Step 4: Define the Study Boundaries;
- Step 5: Develop a Decision Rule;
- Step 6: Specify Tolerable Limits on Decision Errors; and
- Step 7: Optimize the Design.

During the first six steps of the process, the planning team develops decision performance criteria that will be used to develop the data collection design. The final step of the process involves developing the data collection design based on the DQOs. A brief discussion of these steps and their application to this sampling effort are provided in the following subsections.

Step 1: State the Problem

The purpose of this step is to describe the problem to be studied so that the focus of the investigation will not be ambiguous.

Past sampling efforts have demonstrated that elevated concentrations of metals/metalloids are present in attic dust, residential soils and alleys within the CS OU. From a potential risk to human health standpoint, arsenic and lead are considered the Constituents of Concern (COCs) within these areas. Sources of metals contamination may be from industrial impacts including smelter emissions, use of imported backfill materials, historic use of lead arsenate and arsenical pesticides, batteries, leaded gasoline and/or lead-based paint.

Comprehensive sampling of residential soils and alleys within the CS OU was conducted between 2002 and 2010. This remedial design (RD) sampling program was conducted to determine those residential yards and individual yard components (front yard, back yard, garden, etc.) subject to RA based on exceedance of the residential soil action level for arsenic (250 parts per million [ppm]) at targeted depth intervals. In 2006, available "screening level" lead data from these samples were evaluated, summarized and provided to the EPA in 2007 in the *Analysis of Lead in Anaconda Community Soils* (Atlantic Richfield Company, 2007). In the fall of 2007, the EPA conducted additional sampling and evaluation of lead in residential soils in Anaconda. The results of the EPA sampling effort are reported in the *Community Soils OU Residential Subsurface Soil Characterization Data Summary Report* (CDM, 2007).

The Atlantic Richfield Company (Atlantic Richfield) conducted a residential dust study within the CS OU in 2007. This study focused on collecting samples of interior, exterior and attic dust from newer and older homes spatially separated throughout the entire town of Anaconda, both inside and outside the CS OU focus area (residences located east of Main Street in Anaconda). Data generated from this study are presented in the *Draft Final Community Soils Interior and Attic Dust Characterization Study Data Summary Report* (Atlantic Richfield Company, 2008).

The Agencies evaluated these data sets (screening level lead data in residential soil, and subsurface lead and arsenic data in residential soil as well as residential dust data) generated in 2007, and reported the following conclusions in the *Residential Soils Data Interpretation and Analysis Report (DIAR)* (CDM, 2008).

- "*Lead in soils. 95 of the 142 yards (67 percent) that were sampled but not cleaned up had area weighted average lead concentrations above 400 ppm. 125 of the 142 yards (88 percent) evaluated had surface soil lead concentrations above 400 ppm in at least one yard component. 33 of the 142 yards (23 percent) had surface soil lead concentrations in at least one yard component greater than 1,200 ppm. The actual average concentration of lead in surface soils was 507 ppm, which is much higher than the calculated 290 ppm average from the 1996 human health risk assessment (HHRA).*

- *Arsenic in subsurface soils. Some portions of about one third of yards sampled but not cleaned up exceed 250 ppm arsenic in the subsurface. Soils with elevated arsenic generally also have elevated lead and vice versa. Correlations are weaker in subsurface soils than surface soils.*

- *Attic dust. Attic dust concentrations in the Anaconda focus area are significantly higher than interior dust concentrations and show no correlation, suggesting that attic dust does not influence interior dust.*

- *Rural areas. In most rural areas, smelter emissions appear to be the only site-related source of contamination. The exception is part of South Opportunity/Crackerville where tailings were deposited by Silver Bow Creek flooding events and irrigation practices."*

These previous studies have demonstrated the potential for arsenic or lead concentrations above action levels and therefore further sampling is required to define where additional RA is required.

Step 2: Identify the Decision

This step identifies what questions the study will attempt to resolve and what actions may result. The key questions may be stated as follows:

For residential yards to be sampled, does the weighted average composite arsenic concentration in residential soils exceed the 250-ppm residential soil action level at the 0 to 2-inch, 2 to 6-inch and/or 6 to 12-inch depth intervals?

For residential gardens to be sampled, does the garden component arsenic concentration exceed the 250-ppm residential soil action level at the 0 to 2-inch, 2 to 6-inch, 6 to 12-inch 12 to 18-inch, and/or 18 to 24-inch depth intervals?

For residential yards to be sampled, does the lead concentration for an individual yard component (front yard, back yard, etc.) exceed the 400-ppm residential soil action level at the 0 to 2-inch, 2 to 6-inch and/or 6 to 12-inch depth intervals?

For residential gardens to be sampled, does the garden component lead concentration exceed the 400-ppm residential soil action level at the 0 to 2-inch, 2 to 6-inch, 6 to 12-inch 12 to 18-inch, and/or 18 to 24-inch depth intervals?

For Anaconda alleys to be sampled, does the composite lead concentration exceed the residential soil action level of 400 ppm at the 0 to 6-inch depth interval (Anaconda alleys have been evaluated for arsenic previously)?

For residential attic dust meeting the accessible attic dust sampling criteria, does the arsenic and/or lead concentration exceed the residential attic dust action level of 250 ppm or 400 ppm, respectively?

Step 3: Identify the Inputs to the Decision

The purpose of this step is to identify the informational variables that will be required to resolve the decision statements and determine which variables require environmental measurements.

The following data and information are required to satisfy or resolve the decision statements*:*

- *"Arsenic and lead analytical results applicable to residential soil and attic dust samples collected within each residential location;*

- *Lead analytical results applicable to composite soil samples collected from alleys;*

- *Dimensions of residential yards and individual yard components (i.e., front yard, back yard, garden, earthen driveway, etc.);*

- *Weighted-average composite arsenic concentrations within each residential yard at each target depth interva*l (0- to 2 inch, 2- to 6-inch and/or 6- to 12-inch depth*);*

- *Composite lead concentrations within each residential yard component at each target depth interval; and*

- *Risk-based action levels for arsenic and lead in soil and attic dust."*

Step 4: Define the Study Boundaries

The purpose of this step is to define the spatial and temporal boundaries of the problem.

The study area will include residential properties (yard soil and attic dust) and alleys contained within the ADLC SPAOD.

Step 5: Develop a Decision Rule

The purpose of this step is to define the parameters of interest and integrate any previous DQO inputs into a single statement that describes a logical basis for choosing among alternative actions.

Atlantic Richfield will pursue access agreements for soil and attic dust sampling from those residences with available screening level lead data in soil exceeding the 400 ppm action level. All other residences (those with screening level lead data below the 400 ppm action level, those that have been sampled previously but have no lead data available, and those within the ADLC Superfund Planning District that have not been sampled previously) may request sampling of their soil and attic dust.

Composite soil samples and/or attic dust samples will be systematically collected from alleys and residential properties as described in this QAPP. If the composite sample result in an alley is less than the lead residential action level, then no RA will be performed in that alley. If the composite sample result in an alley is greater than or equal to the lead residential action level, then the alley will be remediated to a depth of 6 inches. Specific removal requirements will be identified in an Individual Site Work Plan (ISWP) for each alley subject to RA.

An area-weighted average arsenic concentration will be calculated for each of 3 soil depth intervals (0 to 2-inch, 2 to 6-inch and 6 to 12-inch depths) within each residential yard. However, for residences that were previously sampled under the original CS OU design, area-weighted average arsenic concentrations were already calculated for the 0 to 2-inch depth interval; consequently, for these residences that were previously sampled, samples collected/evaluated for the 0 to 2-inch depth interval under this design will be analyzed for lead only (not to include arsenic) and an area-weighted average arsenic concentration will not be recalculated for this depth interval. If the area-weighted average arsenic concentration is less than the residential action level in all layers, then no arsenic-specific RA will be performed in that residential yard; however, individual components within the yard may still be subject to RA for lead. If the area-weighted average arsenic concentration is greater than or equal to the residential action level within any layer, then each individual yard component (front yard, back yard, earthen driveway, etc.) within the affected layer that exceeds the residential action level for arsenic will be subject to RA. Specific removal requirements will be identified in an ISWP.

Each of the samples described above for arsenic analysis (component and depth interval) will also be analyzed for lead; however, an area-weighted average soil concentration will not be calculated for lead. If an individual yard component and depth interval is less than the residential action level for lead, then that component is not subject to RA at that particular depth interval; however, individual components within the yard may still be subject to RA for arsenic. If an individual yard component and depth interval is greater than or equal to the residential action level for lead, then that component is subject to RA for lead at the affected depth interval. Specific removal requirements will be identified in an ISWP.

Note that any clean soil layers within residential yards located above layers subject to removal will also be removed and not salvaged for replacement.

If a composite attic dust sample result is less than both the arsenic and lead residential dust action levels, then no RA will be performed in that attic. If a composite attic dust sample result is greater than or equal to either the arsenic or lead residential dust action levels, then the attic is subject to RA. Specific removal requirements will be identified in an ISWP.

Step 6: Specify Tolerable Limits on Decision Error

Decision errors occur when data mislead the site managers into choosing an inappropriate response, including no action. The potential for decision errors exists because all analytical measurements inherently contain sampling and measurement errors. Sampling design error occurs when the data collection scheme does not adequately address the inherent variability of the matrix being sampled (e.g., discrete versus composite samples). Measurement error occurs from the inherent variability in the collection, preparation, and analysis of an environmental sample. Sampling design and measurement errors will be minimized by following the procedures outlined in this QAPP and the attached Standard Operating Procedures (SOPs) presented in Attachment A.

Step 7: Optimize the Design

The data collection scheme is designed to ensure that the data will be of sufficient quality and quantity to determine the component(s) of individual residential yards, alleys and attics requiring RA (and the depth to which RA is required in residential yards and alleys). The sampling will be completed in accordance with the recommendations provided in the EPA's *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003).

2.4.2 Measurement Performance Criteria for Data

Measurement performance criteria are established by defining acceptance criteria and quantitative or qualitative goals (e.g., control limits) for accuracy, precision, representativeness, comparability and completeness of measurement data. The definitions of precision, accuracy, representativeness, comparability and completeness are provided below along with the acceptance criteria for data collected. Equations for calculation of precision, accuracy and completeness are provided in Table 2. Information pertaining to the analytical methods that will be employed and the project's target quantitation limits can be found in Section 3.3.2.

Precision

Data precision is assessed by determining the agreement between replicate measurements of the same sample and/or measurements of duplicate samples. The overall random error component of precision is a function of sampling. The analytical precision is determined by the analyses of field duplicates by laboratories and by replicate analyses of the same sample. An analytical duplicate is the preferred measure of analytical method precision. When analytes are present in samples at concentrations below or near the quantitation limit, precision may be evaluated using duplicate analyses of laboratory prepared samples such as duplicate laboratory control samples (LCS/LCSD) and duplicate laboratory matrix spike samples (MS/MSD). Precision can be measured as relative percent difference (RPD) or as relative standard deviation (RSD; also known as a coefficient of variation). Formulae for both are presented in Table 2.

For this QAPP, precision will be determined by the analyses of field duplicates, laboratory (analytical) duplicates, and the evaluation of the RPD for these various paired measurements. The RPD goals for measures of laboratory (analytical) precision are provided in the laboratory SOPs (Attachments A-2 and A-3). The RPD field precision goal for soil field duplicates will be 35 percent for sample pairs with both sample results being greater than 5 times the reporting limit (RL). For soil field duplicate pairs with one or both sample results being less than five times the RL, a difference of less than or equal to two times the RL (difference ≤ 2xRL) will be used as the precision goal.

Accuracy/Bias

Accuracy is the degree of difference between the measured or calculated value and the true value. It is a measure of the bias or systematic error of the entire data collection process. Potential sources of systematic errors include:

- Sample collection methods;
- Physical or chemical instability of the samples;
- Interference effects during sample analysis;
- Calibration of the measurement system; and
- Contamination.

Laboratory blanks will be analyzed to assess artifacts introduced during sampling, transport and/or analyses that may affect the accuracy of the data. In addition, initial and continuing calibration verification samples (ICV and CCVs) and initial and continuing calibration blanks (ICB and CCBs) will be used to verify that the sample concentrations are accurately measured by the analytical instrument throughout the analytical run.

Laboratory accuracy will be determined by calibration verification and laboratory control samples. Accuracy/Bias goals for the specific analyses methods are summarized in the laboratory SOPs (Attachments A-2 and A-3).

Representativeness

Data representativeness is defined as the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point or environmental conditions. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. Representativeness will be achieved through judicious selection of sampling locations and methods. This QAPP has been designed to provide samples that are representative of the medium being sampled as well as a sufficient number of samples to meet the project DQOs and to satisfy the project RA design elements. Sample representativeness will also be evaluated using the RPDs for field duplicate results.

Comparability

Data comparability is defined as the measure of the confidence with which one data set can be compared to another. Comparability is a qualitative parameter but must be considered in the design of the sampling plan and selection of analytical methods, QC protocols and data reporting requirements. Comparability will be ensured by analyzing samples obtained in accordance with this QAPP as well as the appropriate SOPs, which are comparable to the sampling methods used during previous investigations at the site. All data will be reported in units consistent with standard reporting procedures so that the results of the analyses can be compared with results from previous investigations. Soil and dust data will be reported in units of milligrams per kilogram (mg/kg). Attic dust confirmation samples will be reported in units of micrograms per square foot ($\mu g/ft^2$).

Completeness

Completeness refers to the amount of usable data produced during a sampling and analyses program. The procedures established in this QAPP are designed to ensure, to the extent possible, that data will be valid and usable. To achieve this objective, every effort will be made to collect each required sample and to avoid sample loss.

2.5 Special Training

All field personnel will review and be trained in the requirements of this QAPP in a project meeting held prior to fieldwork. A review of sampling procedures and requirements will be completed prior to field activities to ensure sample collection and handling methods are according to QAPP requirements. Field personnel will be trained in proper use of field equipment and procedures according to field data collection SOPs. One hard copy of the current approved version of this QAPP will be maintained for ready reference purposes in the field vehicle and/or field office. All field team personnel will have access to PDF format files of the complete QAPP. The Field Team Leader will assure that each member of the sampling team is familiar with the QAPP and will maintain signatures of each team member who has read the QAPP (including reviews and addenda, as necessary) and has been trained in the appropriate sample collection methods per the SOPs. A copy of the field team signature page will be attached to the copy(ies) of the QAPP maintained in the field.

A review of the SSHASP will be conducted with all field personnel prior to fieldwork to assess the site's specific hazards and the control measurements that have been put in place to mitigate these hazards. The SSHASP review will cover all other safety aspects of the site including, site personnel responsibilities and contact information, additional site-specific safety requirements and procedures, and the emergency response plan.

Laboratories providing analytical services will have a documented QC program that complies with EPA *Requirements for Quality Assurance Project Plans* (QA/R-5) (EPA, 2001) and Atlantic Richfield's LaMP. The Contractor QA Officer will be responsible for ensuring that all personnel have been properly trained and are qualified to perform assigned tasks.

2.6 Documents and Records

This section describes procedures for documentation management and record keeping for this QAPP from initial record generation through final data formatting and storage.

2.6.1 Property Access Agreements

Atlantic Richfield will request that all private property owners grant access to their properties for all RA-related activities, including sampling. The Field Team Leader will manage requests for access, track the status of access requests and maintain copies of completed agreements received from property owners.

Completed agreements will be photocopied and scanned with the electronic version stored on a hard drive. Photocopied access agreements will also be copied to the project record files.

2.6.2 Field Logbooks/Data Sheets

Documentation in field logbooks provides a description of site conditions during sampling activities, and provides a permanent record of all field activities. A field logbook and/or appropriate field data sheets (refer to field SOPs) will be used for field activities. When field logbooks are used, each logbook will have a unique document control number, and will be bound and have consecutively numbered pages. The information recorded in these logbooks/field data sheets will be written in ink. Whenever a sample is collected or a measurement is made, a detailed description of the sample location and any additional observations will be recorded. Resource-grade global positioning system (GPS) coordinates will be available for all surveyed residential yard maps.

Field logbooks/field data sheets will include the information listed below, at a minimum:

- A description of the field task;
- Time and date fieldwork started;
- Location and description of the work area, including sketches if possible, map references and references to photographs collected;
- Names and titles of field personnel;
- Name, address and phone number of any field contacts or site visitors (e.g., Agency representatives, auditors, etc.);
- Meteorological conditions at the beginning of fieldwork and any ensuing changes in the weather conditions;
- Details of the fieldwork performed and the field data sheets used with special attention to any deviation from the QAPP or applicable field SOPs;
- All field measurements made;
- Any field analyses results; and
- Personnel and equipment decontamination procedures.

For any field sampling work the following entries will be made:

- Sample location and ID number;
- Sample type collected;
- Date and time of sample collection;
- Split samples taken by other parties (note the type of sample, sample location, time/date, name of person, person's company and any other pertinent information);
- Sampling method, particularly any deviations from the field SOPs;
- Documentation or reference of preparation procedures for reagents or supplies that will become an integral part of the sample (if any used in the field), specifically if sample bottles/preservatives are not provided by the laboratory and certified as cleaned; and
- Sample preservation (if used).

Changes in the field logbook or on the field data sheets will be recorded with a single strike mark through the changed entry, with the sampler's initials and the date recording the new entry. All entries must remain legible. Sufficient information should be recorded to allow the sampling event to be reconstructed without having to rely on the sampler's memory.

Completed field data sheets and logbooks will be photocopied and scanned with the electronic version stored on a hard drive. Photocopied field records will also be copied to the project record files (refer to Section 3.6). No bound field logbooks will be destroyed or thrown away even if they are illegible or contain inaccuracies that require a replacement document.

2.6.3 Field Photographs

Photographs may be taken of sampling locations and field activities using a digital camera. Photographs should include a scale in the picture when practical. Additional photographs documenting site conditions will be taken, as necessary. Documentation of all photographs taken during sampling activities will be recorded in the bound field logbook or appropriate field data sheets (refer to field SOPs), and will specifically include the following for each photograph taken:

- The photographer's name, date, time, and the general direction faced;
- A brief description of the subject and the fieldwork portrayed in the picture; and
- Sequential number of the photograph.

The digital files will be placed in project files with copies of supporting documentation from the bound field logbooks.

2.6.4 Chain of Custody Records

After samples have been collected, they will be maintained under strict chain of custody protocols in accordance with the CS OU Field SOPs provided in Attachment A-1. A copy of each as-transmitted chain of custody form will be scanned and stored on a hard drive. Chain of custody records will also be copied to the project record files (refer to Section 3.6).

2.6.5 Analytical Laboratory Records

Results received from the laboratories will be documented both in report form and in an electronic format. Laboratory documentation includes copies of the signed chain of custody forms, laboratory confirmation reports including information on how samples have been batched and the analyses requested, data packages including the laboratory report and the electronic data deliverable (EDD), and any change requests or corrective action requests. Section 5.1.3 presents the project's laboratory reporting requirements in detail. The deliverable ("data package" or "report") issued by the laboratories will include data necessary to complete validation of laboratory results in accordance with specifications included in Section 5.2.2.

Original reports and electronic files received from laboratories will be maintained with the project quality records (refer to Section 3.6).

2.6.6 Project Data Reports

Upon receipt of laboratory results and completion of the data review/validation process, all analytical data will be uploaded into a project database. The database will summarize sample data from yards and unpaved alleys as well as attic dust.

The sample results (for all analytes) will be reported to individual landowners along with a letter explaining what the results indicate. The action levels for arsenic and lead will be reported, along with sample results. The content of the letter explaining sample results to landowners will be determined in consultation with EPA.

Following landowner notification, sample results will be used to develop ISWPs for each residence where sample results exceed CS OU action levels ($\geq$250 ppm arsenic and $\geq$400 ppm lead). The ISWPs will summarize the number of individual yard components associated with each property, depth of each sample and corresponding surface area of each yard component.

All sampling data will be forwarded to the Agencies for review and approval in the form of an annual Data Summary Report (DSR). This DSR will include figures displaying location of homes sampled, analytical results, data review/validation reports, and copies of all field data and all daily logbook entries. As described above, all sampling data will reside in the project database.

2.6.7 Quality Records

Quality records are defined as completed, legible documents that furnish objective evidence of the quality of items or services, activities affecting quality, or the completeness of data. These records will be organized and managed by the Contractor QA Officer (or designee) and will include, at a minimum:

- This QAPP and any approved revisions or addenda;
- Approved versions of the SSHASP and any addenda;
- Copies of field SOPs for field data collection, with any updates, revisions or addenda to those SOPs;
- Incoming and outgoing project correspondence (letters, telephone conversation records, faxes and e-mail messages);
- Copies of completed access agreements for the individual properties sampled;
- Individual property maps, including any field drawings and field photographs;
- Field documentation forms;
- Copies of all bound field logbooks;
- Copies of all field data sheets;
- Copies of all sample chain of custody forms;
- Copies of all laboratory agreements and amendments;
- Laboratory data packages (hard copy report and electronic);
- Documentation of field and/or laboratory audit findings and any corrective actions; and
- Draft and final delivered versions of all reports and supporting procedures such as statistical analyses, numerical models, etc.

All project data will be maintained in the CS OU Residential Soils and Attic Dust Global Information System (GIS) Database. This is a long-term project with access to the database provided to many interested parties. The data will be maintained indefinitely.

3.0 MEASUREMENT AND DATA ACQUISITION

This section addresses all aspects of project design and implementation for generating and acquiring data. Implementing these elements ensures that appropriate methods for sampling, sample handling, laboratory analyses, field and laboratory QC, instrument/equipment testing, inspection, maintenance, instrument/equipment calibration, data management and data security are used when implementing this QAPP.

3.1 Sampling Process and Design

The residential soil and attic dust sampling procedures detailed in this plan focus on those properties within the CS OU with existing screening level data in soil showing lead concentrations equal to or greater than 400 ppm. A soil and attic dust sampling access agreement letter with a questionnaire will be mailed to each affected resident. The questionnaire will request information regarding the presence of pregnant women and/or children age 12 or younger living within or frequenting the residence as well as information regarding age of the home and activities/circumstances that may result in exposure to attic dust. This feedback (presence of sensitive population) will be used in conjunction with existing lead data to prioritize the sampling schedule. Residences with the highest lead concentrations and presence of sensitive population will be scheduled to be sampled earliest. All other properties may be sampled per request by the landowner.

3.1.1 Residential Soils and Alleys Field Sampling Plan

Residential yards will be sampled according to the procedures outlined in this QAPP, which is based on both the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003) and the *Final Community Soils Operable Unit (CS OU) Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* (Atlantic Richfield Company, 2002). To the extent practical, the previously delineated and approved CS OU residential yard components within each yard will continue to be used under this project.

Residential soil samples for each yard component will be collected from three depth intervals (except for those components that were previously remediated to a depth of 12 inches, or deeper). The first composite sample will consist of subsamples from the 0 to 2-inch depth interval, the second composite sample will consist of subsamples from the 2 to 6-inch depth interval, and the third composite sample will consist of subsamples from the 6 to 12-inch depth interval. The rationale for the 12-inch maximum sampling depth is detailed further in Attachment B-1: Technical Memorandum #2 – *Modifying the Sample Depth Intervals Used to Make Remedial Decisions for Arsenic and Lead in Yard Soils* (Atlantic Richfield Company, 2014a). The Agencies approved this change in the September 8, 2014 letter provided in Attachment B-3.

Consistent with the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA, 2003), RA decisions applicable to removing soils with lead concentrations equal to or greater than the 400 ppm action level will be based on a component-specific basis. Consistent with the original CS OU design, RA decisions applicable to removing soils with arsenic concentrations greater than or equal to the 250 ppm action level will be based on an area-weighted average basis. However, for residences that were previously sampled under the original CS OU design, area-weighted average arsenic concentrations were already calculated for the 0 to 2-inch depth interval; consequently, for these residences that were previously sampled, samples collected/evaluated for the 0 to 2-inch depth interval under this design will be analyzed for lead only (not to include arsenic) and an area-weighted average arsenic concentration will not be recalculated for this depth interval. However, area-weighted average arsenic concentrations will be calculated for the 2 remaining depth intervals (2 to 6 inches and 6 to 12 inches). Any clean cover soil in previously remediated components will not be resampled under this design, but will be assigned an average arsenic concentration of 19.1 ppm (average arsenic concentration measured in the Type A borrow soil samples collected during the previous CS OU RA) when calculating the AWA arsenic concentration. For residences that were not previously sampled under the original CS OU design for arsenic, area-weighted average concentrations will be calculated for 3 depth intervals (0 to 2 inches, 2 to 6 inches, and 6 to 12 inches).

The number of residential yards ultimately sampled will depend on the number of access agreements secured by Atlantic Richfield from the residential property owners within the ADLC SPAOD. In addition to residential yards, unpaved alleys in Anaconda with existing screening level data showing lead concentrations equal to or greater than 400 ppm will be sampled to a depth of 6 inches below ground surface (bgs). Alley samples will be analyzed for lead only because alleys were previously evaluated for arsenic under the original design.

Alleys are well compacted with infrequent exposure by residents and are unlikely to be excavated via hand tools by residents to a depth beyond 6 inches. Additionally, a General Utility and Service (GUS) Permit is required for excavation conducted in alleys by ADLC personnel and contractors; consequently, such exposure to soils deeper than 6 inches in alleys will be addressed through Institutional Controls (ICs).

3.1.1.1 Standard Operating Procedures for Sampling Activities

The CS OU Field SOPs located in Attachment A-1 describe the procedures involved with CS OU RD soil and attic dust sample collection, handling, and shipment. Unless otherwise described in this QAPP, the procedures outlined in the CS OU SOPs will be followed for all CS OU soil and attic dust sampling activities.

3.1.1.2 Yard/Lot Maps

A surveyed map was created for each individual residential property sampled during the original CS OU RD sampling effort (Figure 3). These maps identify how each property was divided into individual components (i.e., front yard, back yard, earthen driveway, etc.) and will be used for this CS OU RA sampling effort. In the event that a map does not exist or the existing map is inadequate, a new surveyed map will be created. Each map includes the following information:

- Surface area applicable to each individual yard component (e.g., front yard, back yard, earthen driveway, etc.);
- Surface area applicable to the “occupation” boundary of each residence (approximately corresponding with the property boundary);
- House location;
- Garage location;

- Location of miscellaneous structures (e.g., patios, concrete pads, sidewalks, decks, etc.); and
- Any noticeably dissimilar soil material types or surface conditions (i.e., bare ground areas, areas where paint chips were observed, locations of obvious imported fill materials, etc.).

All subsample locations will be plotted on the map by sampling crews in the field. Photographs will be taken of yard components as well as any unusual features, as deemed necessary by field personnel. All information will be recorded in the field logbook.

3.1.1.3 Sample Density, Location and Compositing

Composite soil samples will be collected from each individual residential yard component when sampling each residential yard. If the component was previously remediated to 12 inches bgs or deeper, samples from the 2 to 6-inch and 6 to 12-inch depth intervals will not be collected, but will be assigned an average arsenic concentration of 19.1 ppm when calculating the AWA arsenic concentration. If the component was previously remediated to 6 inches bgs, the sample from the 2 to 6-inch depth interval will not be collected, but will be assigned an average arsenic concentration of 19.1 ppm when calculating the AWA arsenic concentration. The sample from the 6 to 12-inch depth interval will be analyzed for both lead and arsenic (to be included in the area-weighted average calculation). The CS OU Residential Yard Remedial Action Decision Flow Charts (which are used to develop sampling rationale for individual components) are located on Figures 4 through 9. All samples collected, as well as other relevant observations will be documented on the Residential Yard Sampling Field Data Sheet located in Attachment C-1. Subsamples collected from each component will be composited in the field, and a single composite sample applicable to each identified depth interval for each component will be submitted to the laboratory and analyzed for arsenic and/or lead, as appropriate.

Sample densities and locations within the yard components will be determined based on the size of the area to be represented. Either the property boundary or a smaller natural boundary within the yard will be used to establish the extent of the sample area. The yard area will be defined as a maximum of 125 feet from the exterior of the residence, unless a property boundary or natural barrier (i.e., fence, hedge, tree line, abrupt change in grade, etc.) is encountered at a distance less than 125 feet. The 125-foot distance is considered a guideline and can be adjusted in the field by Agency personnel, as appropriate. For the majority of the residential properties likely to be sampled under this investigation, site maps were created during the previous CS OU sampling investigation. These maps detail individual components and their respective surface areas for each property. To the extent practical, these existing maps and corresponding components will continue to be used. One subsample per individual yard component will be collected unless the component is greater than 625 square feet (ft^2) (25 feet by 25 feet) in surface area. If the yard component exceeds 625 ft^2, additional subsamples will be collected to meet the sample collection density of 1 subsample for each 625 ft^2. When multiple subsamples are collected from a single yard component (e.g., >625 ft^2), they will be composited in the field, and a single composite sample will be analyzed for arsenic and/or lead, as appropriate. Each residential yard will be evaluated for arsenic based on the area-weighted average composite concentration at each depth interval (see example shown in Table 3). Each residential yard will be evaluated for lead based on a component-specific basis. A maximum of 8 soil subsamples will be collected from any individual residential yard component regardless of the surface area of that component. Larger parcels, such as schools and parks, etc., may require multiple components to ensure adequate coverage and protectiveness.

In accordance with the CS OU Field SOPs (located in Attachment A-1), play areas, vegetable gardens, flower gardens, earthen driveways, and source areas (areas of visible smelter-related waste material), will have a minimum of two subsamples collected regardless of the surface area involved. The two subsample locations will be composited into one sample for each depth interval.

Discrete "drip zone" component samples will not be collected. Subsamples will be collected from within drip zones associated with a residence and the subsample will be included in the nearest component's composite sample. If the component's composite sample exceeds the arsenic and/or lead action level(s), the drip zone will be removed and replaced (in kind) along with the targeted component.

Soil subsamples will not be collected from yard components between neighboring/adjacent homes where the distance between the homes is less than 3 feet. Additionally, soil subsamples will not be collected from beneath a tree canopy. If the yard component surrounding the tree is subject to RA, soil excavation under the tree canopy will not be completed (Sheet 8 of Appendix D).

If the Agency representative or property owner chooses to collect split samples, an adequate quantity of soil will be made available by the sampler at the time of sample collection. However, the Agency representative or property owner will be responsible for providing sample containers and coolers, etc.

3.1.1.4 Sample Depths

The following 2 sections detail CS OU soil sampling depths for both residential soil and unpaved alley samples.

3.1.1.4.1 Residential Soil Samples

Within residential properties, three depth samples will be collected from each identified yard component. There will be 1 surface sample (0 to 2 inches bgs) along with 2 subsurface samples (2 to 6 inches bgs and 6 to 12 inches bgs). For residences that were previously sampled under the original CS OU design, area-weighted average arsenic concentrations were already calculated/evaluated for the 0 to 2-inch depth interval; consequently, for these residences that were previously sampled, samples collected from the 0 to 2-inch depth interval under this design will be analyzed for lead only (not to include arsenic) and an area-weighted average arsenic concentration will not be recalculated for this depth interval. The CS OU Residential Yard Remedial Action Decision Flow Charts (which are used to develop sampling rationale for individual components) are located on Figures 4 through 9. .

Because most residential yard/lot areas are expected to be covered with grass, the surface sample will be collected immediately beneath the vegetative mat (sod), or in the absence of vegetation, 0 to 2 inches bgs. If a vegetative mat is present, it will be separated from the soil surface with a stainless steel knife or equivalent. The removed vegetative mat will be shaken and scraped over the sample collection bowl to dislodge any mineral soil particles. All dislodged soil particles will be included in the composite sample.

Exceptions to this procedure will occur when the sample location falls on a graveled driveway or similar surface. If the surface material is coarse-grained and free of intermixed materials, the sample will be collected from the 0 to 2-inch soil layer immediately beneath the coarse materials. However, if the graveled driveway or similar surface contains fine soil/dust material on the surface, the sample will be collected from the surface (0 to 2-inch) layer.

Vegetable and flower gardens will be subject to additional subsurface sampling. In addition to the three depth samples described above, one subsurface sample will be collected from the 12 to 18-inch depth interval and another will be collected from the 18 to 24-inch depth interval, for a total of 5 depth samples (1 surface and 4 subsurface) within a vegetable or flower garden. Vegetable and flower gardens will be evaluated on a component-specific basis for arsenic, regardless of the area-weighted average result. If the arsenic concentration is greater than or equal to the 250 ppm action level, then that component is subject to RA for arsenic at the affected depth interval. Similarly, if the lead concentration is greater than or equal to the 400 ppm action level, then that component is subject to RA for lead at the affected depth interval. Specific removal requirements will be identified in an ISWP.

The decision to collect additional "opportunistic" samples will be made in the field by the sampling crew personnel and/or Agency personnel during the time of sampling. All CS OU residential soil samples will be shipped to an Atlantic Richfield LaMP certified laboratory, for analyses.

3.1.1.4.2 Unpaved Alley Samples

Unpaved alleys in Anaconda with existing screening level data showing lead concentrations equal to or greater than 400 ppm will be re-sampled to a depth of 6 inches bgs. All samples collected, as well as other relevant observations will be documented on the Unpaved Roads and Alley Sampling Field Data Sheet located in Attachment C-2. Alley samples will be analyzed for lead only because alleys were previously evaluated for arsenic under the original design. Alley samples will not be collected to a depth beyond 6 inches bgs. Alley subsamples will be collected from each end of the alley and at one location between the ends of the alley, for a total of three subsamples. The three alley subsamples will be combined into one composite sample per alley and submitted to the laboratory for analyses. All CS OU alley samples will be shipped to an Atlantic Richfield LaMP certified laboratory for analyses.

3.1.1.5 Sample Identification

Sample identification procedures for both CS OU residential soil samples and unpaved alley soil samples are detailed in the sections below.

3.1.1.5.1 Residential Soil Sample Identification

An alphanumeric coding system will be used to uniquely identify each sample collected during this residential soils investigation. Sample identifiers will begin with an Anaconda or regional property code (i.e., A, R, OP). This will be followed by the CS OU Database Resident ID (i.e., A-0001, A-0002) associated with a specific residential property (address and/or geocode specific). Following the CS OU Database Resident ID will be an alpha identifier for the yard component represented by the sample (i.e., FY for front yard or BY for back yard, etc.). A four-digit numeric code will follow, indicating the sample depth interval. The following is a list of the codes to be used in sample identification:

Site Property Code: A – Anaconda Residential Properties
R – Regional Residential Properties
OP – Opportunity Residential Properties

CS OU Database Resident ID: 0001 – CS OU Database Resident ID, associated with specific address or geocode

Yard Component: FY – Front Yard
BY – Back Yard
ED – Earthen Drive
FG – Flower Garden
VG – Vegetable/Fruit Garden
PA – Play Area
BA– Bare Area
SA – Source Area
BV – Boulevard

Quality Control/ Quality Assurance: D – Field Duplicate

Depth Intervals: 0002 – 0 to 2 inches bgs
0206 – 2 to 6 inches bgs
0612 – 6 to 12 inches bgs
1218 – 12 to 18 inches bgs
1824 – 18 to 24 inches bgs

An example sample identification would be: R-0001-BY-0206. This indicates that the sample was collected at the regional residential property R-0001 (corresponding to a physical address and/or geocode) at the 2 to 6-inch depth interval in the back yard. Sample identifiers will be documented in field notebooks, on the Residential Yard Sampling Field Data Sheet, and on the chain of custody forms, as required by the CS OU Field SOPs located in Attachment A-1.

3.1.1.5.2 Unpaved Alley Soil Sample Identification

Unpaved alley samples will be identified according to the kriging grid detailed in the *Anaconda Smelter NPL Site, Community Soils Operable Unit (CS OU), Anaconda Residential Soils, Regional Soils, and Railroad Areas, Data Interpretive Report (DIR)* (AERL, 1999) (see Appendix F for alley locations and IDs).

An example alley sample identification would be: P-35-A-0006. This indicates that the sample was collected from the Anaconda unpaved alley labeled as P-35 at the 0 to 6 inches bgs depth interval. Sample identifiers will be documented in field notebooks, on the Unpaved Roads and Alley Sampling Field Data Sheet, and on the chain of custody forms, as required by the CS OU Field SOPs located in Attachment A-1.

3.1.2 Attic Dust Field Sampling Plan

The CS OU attic dust field sampling plan detailed below outlines all aspects of the process including sampling eligibility, sampling methods and confirmation sampling. Interior dust is not a part of this CS OU investigation. The basis for excluding interior dust sampling and the method for addressing attic dust is covered in Attachment B-2: *Technical Memorandum #1 – Basis for Excluding Living Space Dust and Addressing Only Accessible Attic Dust through Analysis of the Existing Data* (Atlantic Richfield Company, 2014b). The Agencies approved this change in the September 8, 2014 letter provided in Attachment B-3.

Abatement of asbestos-containing materials is not intended to be included as part of the attic dust program. If materials suspected to contain asbestos are encountered in an attic and would be disturbed by the RA, an inspection and sampling of these materials will be conducted. The samples will be collected by an accredited asbestos inspector and analyzed by an accredited asbestos laboratory. The quantity and location of the samples will be determined by site conditions. If the materials in question are determined to be a non-asbestos containing material (i.e., less than 1% asbestos), then the dust abatement activities may proceed. If the materials in question are determined to be asbestos containing material (i.e., greater than 1% asbestos), then an alternative plan will be developed, in coordination with the property owner and the Agencies.

3.1.2.1 Attic Dust Sampling Eligibility

The CS OU attic dust sampling design focuses on those properties with existing screening level data in soil showing lead concentrations equal to or greater than 400 ppm. A soil and attic dust sampling access agreement letter with a questionnaire will be forwarded to each affected resident. The questionnaire will request information regarding the presence of pregnant women and/or children age 12 or younger living within or frequenting the residence as well as information regarding age of the home and activities/circumstances that may result in exposure to attic dust. This feedback (presence of sensitive population) will be used in conjunction with existing lead data to prioritize the sampling schedule. Residences with the highest lead concentrations and presence of sensitive population will be scheduled to be sampled earliest. All other residences within the SPAOD meeting the eligibility criteria will need to request attic dust sampling.

In order to be eligible for attic dust sampling, the home must have been constructed prior to 1980 and meet at least 1 of the following conditions:

1. The attic is used as living space.

2. On average, the resident(s) enters the attic more than once per week.

3. The ceilings in the living space immediately below the attic are in a condition of disrepair with obvious exposure to the attic.

4. The resident has contacted ADLC (per Community Protective Measures Program [CPMP] public outreach programs) regarding concerns about attic dust, which may result from a home remodeling project.

If the above qualifications are met, attic dust samples will be collected. If the criteria are not met, then no exposure pathway to the attic exists and the attic does not pose an unacceptable risk to the residents.

3.1.2.2 Attic Dust Sampling Equipment and Sample Collection

Attic dust samples will be collected using the Micro-Vacuum Surface Dust Sampler. Attic dust sampling will be performed in accordance with the CS OU Field SOPs, located in Attachment A-1. As detailed in the SOP, attic dust sampling procedures will follow the *American Society for Testing and Materials (ASTM) D7144-05a: Standard Practice for Collection of Surface Dust by Micro-vacuum Sampling for Subsequent Metals Determination* (ASTM, 2006). The Micro-Vacuum Sampler is designed to collect dust using a nozzle attached to a filter holder (sampling cassette) that is connected to an air sampling pump. Depending on accessibility, samples will be collected from a minimum of two locations within the attic and composited into one representative sample. All attic dust sampling activities will be documented on the Attic Dust In-Home Sampling Data Sheet located in Attachment C-3.

3.1.2.3 Attic Dust Sample Identification

An alphanumeric coding system will be used to uniquely identify each attic dust sample collected during this investigation. Sample identifiers will begin with an Anaconda, regional or Opportunity residential property code (i.e., A, R, OP). This will be followed by the CS OU Database Resident ID (i.e., A-0001, A-0002) associated with a specific residential property (address and/or geocode specific). Following the CS OU Database Resident ID will be an alpha identifier indicating attic dust sample (i.e., AD for attic dust). The following is a list of the codes used for attic dust sample identification:

Site Property Code: A – Anaconda Residential Properties
R – Regional Properties
OP – Opportunity Residential Properties

CS OU Database Resident ID: 0001 – CS OU Database Resident ID, associated with specific address or geocode

Sample Location: AD – denotes attic dust sample;

QA/QC D – Field Duplicate

An example sample identification would be: A-1250-AD. This indicates that an attic dust sample was collected at the Anaconda residential property A-1250 (corresponding to a physical address and/or geocode). Sample identifiers will be documented in the field notebooks, the Attic Dust In-Home Sampling Data Sheet and on the chain of custody forms, per the CS OU Field SOPs (Attachment A-1).

Sample filters are delivered by the supplier using a unique and consecutive numbering system. The numbers are assigned during the filter preparation (pre-weighing) process. The filter number provided by the supplier will also be documented in the field notebooks and the Attic Dust In-Home Sampling Data Sheet.

3.1.2.4 Attic Dust Sample Handling

All filters collected during attic dust sampling operations with the Micro Vacuum Surface Dust Sampler will be placed in a ziplock bag and delivered to an Atlantic Richfield LaMP certified laboratory, to be analyzed for arsenic and lead. All samples will be transferred and handled using established chain of custody procedures which are detailed in the CS OU Field SOPs located in Attachment A-1.

3.1.2.5 Attic Dust Confirmation Sampling

Following cleanup of an attic, confirmation sampling will be performed within the attic in accordance with the *Lead Dust Sampling Technician Field Guide, EPA-W-04-022* (EPA, 2009) located in Attachment D. Confirmation sampling will consist of wiping the encapsulation material on the attic floor following encapsulation material placement. If confirmation sampling provides a lead result greater than or equal to 40 micrograms per square foot ($\mu g/ft^2$), encapsulation material will be re-applied, followed by another round of confirmation sampling. All confirmation wipe samples will be placed in a ziplock bag and delivered to an Atlantic Richfield LaMP certified laboratory, to be analyzed for lead. The following steps will be used during confirmation sampling:

1. Sampler will don disposable boot covers and layout the confirmation sampling area. The sampling area will be designated using a clean template or tape. The sampling area will be as close to square, in shape, as possible.

2. Sampler will prepare the sample container/tube by recording the sample identification code on a clean tube, field logbook, sample form, and chain of custody form.

3. Sampler will don a clean/new set of disposable sampling gloves, being careful not to touch anything except the sampling wipe.

4. Sampler will wipe the sample area and place the wipe in the labeled sample tube. To begin sampling, press the wipe down firmly in one of the upper corners of the sample area. Making an "S" motion wipe the entire sample area moving from side to side. Fold the wipe in half making sure to fold the used side in. Starting in the same corner wipe the entire sample area in a forward and back motion. Fold the wipe again. Wipe the area a third time focusing on the corners and edges of the sample area. Fold the sample side of the wipe in again a third time and place the wipe into the labeled sample tube. Seal the container and discard the disposable gloves.

5. Sampler will measure the width and length of the sample area (unless a template of known area is used) to the nearest 1/8 inch. Record the dimensions of the sample area on the sample container and the sample form.

6. Using the sample area measurements, sampler will calculate the sample surface area and record in the field logbook as well as on the sample collection form and chain of custody form.

7. If a template was used, sampler will clean it with a clean wipe and place the template in a plastic bag for storage.

8. Sampler will ship samples to a laboratory recognized by the National Lead Laboratory Accreditation Program (NLLAP) as being proficient in lead in dust analysis. All CS OU attic dust confirmation samples will be delivered to an Atlantic Richfield LaMP certified laboratory, to be analyzed for lead.

Following confirmation sampling and verification that the lead dust level is below 40 µg/ft^2, the residential property sampled will be updated in the CS OU database as RA Complete for attic dust.

3.1.2.5.1 Attic Dust Confirmation Sampling Sample Identification

An alphanumeric coding system will be used to uniquely identify each sample collected during attic dust confirmation sampling. Sample identifiers will begin with a residential property code (i.e., A, R, OP). This will be followed by the CS OU Database Resident ID (i.e., A-0001, A-0002) associated with a specific residential property (address and/or geocode specific). Following the CS OU Database Resident ID will be an alpha identifier indicating sample matrix (i.e., CWS for attic dust confirmation wipe sample). The following is a list of the codes to be used in sample identification:

Site Property Code: A – Anaconda Residential Properties
R – Regional Properties
OP – Opportunity Residential Properties

CS OU Database Resident ID: 0001 – CS OU Database Resident ID, associated with specific address or geocode

Sample Location: CWS – denotes attic dust confirmation sample (confirmation wipe sample)

An example sample identification would be: A-1250-CWS. This indicates that an attic dust confirmation wipe sample was collected at the Anaconda residential property A-1250 (corresponding to a physical address and/or geocode). Sample identifiers will be documented in the field notebook, the Attic Dust In-Home Sampling Data Sheet and on the chain of custody forms, per the CS OU Field SOPs located in Attachment A-1.

3.2 Laboratory Methods

All soil samples collected for this investigation will be analyzed for arsenic and lead. All attic dust samples, including confirmation wipe samples, will be analyzed for arsenic and/or lead, as appropriate. All samples for this investigation will be analyzed by an Atlantic Richfield LaMP certified laboratory. The sample preparation and analytical methods to be used for this investigation are described in Sections 3.2.1 and 3.2.2.

3.2.1 Soil Preparation Methods

Sample preparations and analyses will be in accordance with the EPA analytical method specifications as well as standard laboratory practices. The soil samples will be prepared for metals analyses by air drying and then sieving the sample to obtain the fine-grained fraction for analyses. Each as-received soil sample will be sieved to homogenize the sample and obtain fine-grained material for analyses. The sample will first be air dried at room temperature (<40 degrees Celsius [^{o}C]) and then sieved using a No. 60 sieve to obtain the fine fraction, <250 micrometers or microns (μm), for metals analyses. The remaining coarse fraction will be placed in a new plastic bag labeled with the original sample number, date of sieving, and "Coarse Fraction" and then archived along with the remaining fine fraction for a minimum of two years for potential future use. The weight of the original dried sample, the weight of the coarse fraction, and the weight of the fine fraction will be measured and recorded by the laboratory for each soil sample prepared in this manner. The SOP (from a previously used laboratory) addressing soil drying and sieving is included in Attachment A-2.

3.2.2 Soil Metals Analyses Methods

All soil samples will be analyzed for arsenic and/or lead, as appropriate. Sample preparations and analyses will be in accordance with the referenced EPA analytical method specifications as well as standard laboratory practices. The fine fraction of the sieved soil will be digested according to modified EPA Method 3050B, and analyzed by EPA Method 6010 (inductively-coupled plasma atomic emission spectroscopy [ICP-AES]). The SOPs for EPA Methods 3050B and 6010 (from a previously used laboratory) are included in Attachment A-2.

3.2.3 Attic Dust Preparation Methods

Sample preparations and analyses will be in accordance with the EPA analytical-method specifications as well as standard laboratory practices. The attic dust (filter cartridge or confirmation wipe) samples will be prepared for analyses by first determining the net weight of the dust sample. The method used to determine the weight of the filter cartridge sample is dependent on the type of cartridge used and type of data provided by the manufacturer (i.e., tare weight of filter, blank filter, weight of entire cartridge, etc.). After the net weight of the dust sample (filter cartridge or confirmation wipe) is determined and recorded, the sample is ready for digestion according to modified EPA Method 3050B. The SOP addressing attic dust filter cartridge and confirmation wipe sample preparation (from a previously used laboratory) is included in Attachment A-3.

3.2.4 Attic Dust Analyses Methods

All attic dust samples will be analyzed for arsenic and lead. Sample preparations and analyses will be in accordance with the referenced EPA analytical method specifications as well as standard laboratory practices. The attic dust samples will be digested according to EPA-modified Method 3050B, and analyzed by EPA Method 6010 (ICP-AES). Results of the attic dust analyses will be reported on a dry-weight basis, with percent moisture also being reported to allow for future conversion of dry weight to wet weight concentrations, if necessary. The SOPs for EPA Methods 3050B and 6010 (from a previously used laboratory) are included in Attachment A-3.

3.3 Quality Control

Sample QC protocols will be consistent with the CS OU Field SOPs in Attachment A-1 and will include 1 field duplicate collected for every 20 primary samples or once per sampling event, whichever is more frequent (in accordance with Level A/B field screening/data review criteria, Attachment F). A temperature blank will additionally be collected for every cooler shipped to the laboratory to ensure the samples were maintained within the temperature of <6 ºC, but above freezing. All sampling equipment is anticipated to be "one time use"; therefore, no external contamination blank/cross-contamination blank samples will be submitted unless the equipment has to be decontaminated and used between samples. Any deviation from the SOPs or this QAPP will be identified in the logbook and discussed in the annual DSR.

All sampling activities will follow the field SOPs. All field SOPs were developed from the *Clark Fork River Superfund Site Investigations* (*CFRSSI) SOPs* (ARCO, 1992), and represent updated versions of those SOPs for the sampling activities conducted under this QAPP. Applicable CS OU Field SOPs are included in Attachment A-1.

3.3.1 Field Quality Control Samples

Field QC samples are used to identify any biases from transportation, storage, and field handling processes during sample collection, and to determine sampling precision. All field QC samples will be shipped with field samples to the laboratory per the CS OU Field SOPs in Attachment A-1. Brief descriptions of these QC samples to be collected during sampling activities described in this QAPP are provided below along with instructions for their frequencies of collection and analyses.

Field Duplicate

A field duplicate consists of one well mixed and homogenized sample, which is split in the field into two samples and placed in different sample containers for separate analyses. Each split will have its own sample number. Both split samples will be analyzed for identical chemical parameters. The results of the field duplicate will be compared to determine laboratory precision. Field duplicate samples will be collected at a frequency of 1 per 20 samples or once per sampling event, whichever is more frequent.

3.3.2 Laboratory Quality Control Samples

All analyses will be governed by the appropriate calibration procedures and frequencies that are specified in the laboratory's SOPs. The project SOPs for the referenced EPA methods are included in Attachments A-2 and A-3, respectively. Although laboratories for this project have not yet been determined, these SOPs are from laboratories that have conducted similar laboratory work in the past.

Laboratory QC samples will be analyzed in addition to the calibration samples with each QC batch. Laboratory QC samples are introduced into the measurement process to evaluate laboratory performance and sample measurement bias. Control samples may be prepared from environmental samples or generated from standard materials in the laboratory. The appropriate type and frequency of laboratory QC samples associated with each method are specified in the laboratory SOPs (Attachments A-2 and A-3, respectively).

Laboratory blanks, laboratory control samples, analytical duplicates, serial dilutions, and pairs of Matrix spike/matrix spike duplicate (MS/MSD) samples will be analyzed in each laboratory QC batch with a minimum frequency of 1 each per 20 field samples. If less than 20 field samples are submitted, then 1 set of these QA/QC samples will still be run with the set of less than 20 samples. A second MS sample is not necessary for all laboratory QC batches that already have one MS/MSD.

Laboratory Blanks

Method blanks will be used to monitor laboratory processes and performance. A method blank is a volume of deionized water or a specified weight of inert material for solid samples that is carried through the entire sample preparation and analyses procedures. The method blank volume or weight will be approximately equal to the sample volumes or sample weights being processed. Method blanks are used to monitor interference caused by constituents in solvents and reagents and on glassware and other sampling equipment. Blank results outside of specified control limits will be re-run and/or flagged by the laboratory per the QC requirements of the analytical method.

Laboratory Control Samples (LCS)

An LCS, or a blank spike, is an aqueous or solid control sample of known composition that is analyzed using the same sample preparation, reagents, and analytical methods employed for the program samples. The LCS is obtained from an outside source or is prepared in the laboratory by spiking reagent water or a clean solid matrix from a stock solution that is different than that used for the calibration standards. The LCS is the primary indicator of process control used to demonstrate whether the sample preparation and analytical steps are in control, apart from sample matrix effects. If the LCS recovery falls outside the specified control limits, the samples will be re-run and/or flagged by the laboratory per the QC requirements of the analytical method.

Analytical Duplicates

Analytical duplicates are samples that are split in the laboratory at some step in the measurement process and then carried through the remaining steps of the process. Duplicate analyses provide information on the precision of the operations involved. Analytical duplicates are a pair of subsamples from a field sample that are taken through the entire preparation and analyses procedure; any difference between the results indicates the precision of the entire method in the given matrix. Analyses of analytical duplicates and matrix spike duplicates monitor the precision of the analytical process. The frequency of analyses, precision goals, and corrective action information pertaining to analytical duplicates are provided in the laboratory SOPs (Attachments A-2 and A-3). If the analytical duplicate precision falls outside the specified control limits, the samples will be re-run and/or flagged by the laboratory per the QC requirements of the analytical method.

Serial Dilutions

Serial dilutions are performed in conjunction with EPA Method 6010 to determine whether or not significant physical or chemical interferences exist due to sample matrix. A serial dilution is performed by analyzing a five-fold dilution of a field sample (field blanks may not be used) and calculating the percent difference between the original determination and the serial dilution result. Serial dilutions are only applicable for analyte concentrations that are greater than 50 times the Method Detection Limit (MDL). The frequency of analyses, precision goals, and corrective action information pertaining to serial dilutions are provided in the laboratory SOPs in Attachments A-2 and A-3.

Matrix Spikes

Laboratory matrix spike samples are used to evaluate potential sample matrix effects on the accurate quantitation of an analyte using the prescribed analytical method. Matrix Spike /MSD are prepared by adding an analyte to a subsample of a field sample before sample preparation and analyses. A percent recovery is calculated from the concentrations of the analyte in the spiked and unspiked samples. If the percent recovery for the MS and MSD falls outside the control limits, the results are flagged by the laboratory that they are outside acceptance criteria along with the parent sample.

3.4 Instrument/Equipment Testing, Inspection and Maintenance

In order to ensure continual quality performance of any instruments or equipment, testing, inspection and maintenance will be performed and recorded as described in this section.

3.4.1 Field Equipment

Field equipment will be examined to certify that it is in proper operating order prior to its first use. Equipment, instruments, tools, and other items requiring preventative maintenance will be serviced in accordance with the manufacturer's specified recommendations. Field equipment will be cleaned and safely stored between each use. Any routine maintenance recommended by the equipment manufacturer will also be performed and documented in field logbooks. Equipment will be inspected and the calibration checked, if applicable, before it is transported to a field setting for use.

3.4.2 Laboratory Equipment

Instruments used by the laboratories will be maintained in accordance with each laboratory's Quality Assurance Plan and analytical method requirements. All analytical measurement instruments and equipment used by the laboratory will be controlled by a formal calibration and preventive maintenance program.

The laboratories will keep maintenance records and make them available for review, if requested, during laboratory audits. Laboratory preventive maintenance will include routine equipment inspections and calibrations at the beginning of each day or each analytical batch, per the laboratory's internal SOPs and method requirements.

3.5 Inspection/Acceptance of Supplies and Consumables

All supplies and consumables received for the project (e.g., sampling equipment, supplies, etc.) will be checked for damage and other deficiencies that would affect their performance. The types of equipment that will be needed to complete sampling activities are described in the relevant SOPs. Inspections of field supplies will be performed by the Field Team Leader or Field Team Members.

The personnel at each laboratory will be responsible for performing inspections of laboratory supplies in accordance with their QA program.

3.6 Data Management Procedures

This section describes the management of data for the project including field and laboratory data. The program quality records will be maintained by Atlantic Richfield. These records, either electronic or hard copy in form, may include:

- Project work plans with any approved modifications, updates, and addenda;
- Individual property maps (hard copy or scanned field drawings and electronic files);
- Project QAPP, including this QAPP, with any approved modifications, updates, addenda, and any approved corrective or preventative actions;
- Access agreements from property owners;
- Field documentation;
- Chain of custody records;
- Laboratory documentation (results received from the laboratory will be documented both in report form and in an electronic format); and
- DSR.

Hard copy field and laboratory records will be maintained in the project's central data file, where original field and laboratory documents are filed chronologically for future reference. These records are also scanned to produce electronic copies. The electronic versions of these records are maintained on a central server system with backup scheduled on a daily basis.

Before field and laboratory data are incorporated into the project database, the data and supporting documentation will be subject to appropriate review to ensure the accuracy and completeness of original data records. Field data that have been reviewed in a hard-copy format will be entered into electronic data files for upload to the project database. All manual data entry into an electronic format will be reviewed by a separate party before such data are incorporated into the database. Laboratory EDDs and related data packages will be reviewed as part of the internal data review process. Following these review steps, field and laboratory electronic data files will be imported to the project database.

Standardized data import formats and procedures will be used to upload both field and laboratory data into the electronic database. Standardized parameter names, numerical formats and units of measure may be applied to the original information to facilitate comparability across all datasets and within the database.

4.0 ASSESSMENT AND OVERSIGHT

Assessment and oversight of data collection and reporting activities are designed to verify that sampling and analyses are performed in accordance with the procedures established in this QAPP. The audits of field and laboratory activities include two independent parts: internal and external audits. Internal audits may be performed by Atlantic Richfield, their contractor or a contracted laboratory as necessary. External audits may be performed by the EPA as necessary.

Performance and systems audits of field and laboratory data collection and reporting procedures are described in this section.

4.1 Corrective Actions

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable procedures or out-of-QC performance which can affect data quality. Corrective action can occur during field activities, laboratory analyses and data assessment.

Non-conforming equipment, items, activities, conditions and unusual incidents that could affect data quality and attainment of the project's quality objectives will be identified, controlled and reported in a timely manner. For the purpose of this QAPP, a non-conformance is defined as a malfunction, failure, deficiency or deviation that renders the quality of an item unacceptable or indeterminate in meeting the project's quality objectives.

Corrective action in the laboratory may occur prior to, during and after initial analyses. A number of conditions such as broken sample containers, preservation or holding-time issues and potentially high-concentration samples may be identified during sample log-in or just prior to analyses. Corrective actions to address these conditions will be taken in consultation with the Contractor QA Officer and reported on a Corrective Action Report (CAR) included in Attachment E. In the event that corrective action requests are not in complete accordance with approved project planning documents, the EPA will be consulted and concurrence will be obtained before the change is implemented.

If during analyses of the samples, the associated laboratory QC results fall outside of the project's performance criteria, the laboratory should initiate corrective actions immediately. Following consultation with laboratory analysts and section leaders, it may be necessary for the Contractor QA Officer to approve implementing a corrective action. These conditions may include dilution of samples, additional sample extract cleanup, or automatic re-injection/re-analysis when certain QC criteria are not met, etc. If the laboratory cannot correct the situation that caused the non-conformance and an out-of-control situation continues to occur or is expected to occur, then the laboratory will immediately contact the Contractor QA Officer and request instructions regarding how to proceed with sample analyses.

Completion of any corrective action should be evidenced by data once again falling within the project's performance criteria. If this is not the case, and an error in laboratory procedures or sample collection and handling procedures cannot be found, the results will be reviewed by the Contractor QA Officer and CPM to assess whether re-analysis or re-sampling is required.

All corrective actions taken by the laboratory will be documented in writing by the Laboratory Project Manager and reported to the CPM and Contractor QA Officer. In the event that corrective action requests are not in complete accordance with approved project planning documents, the EPA will be consulted and concurrence will be obtained before the change is implemented. All corrective action records will be included in the QAPP's quality records.

4.2 Corrective Action during Data Assessment

The Contractor QA Officer may identify the need for corrective action during data assessment. Potential types of corrective action may include re-sampling by the field team, re-analyses of samples by the laboratory or re-submitting data packages with corrected clerical errors. The appropriate and feasible corrective actions are dependent upon the ability to mobilize the field team and whether the data to be collected is necessary to meet the required QA objectives (e.g., the holding time for samples is not exceeded, etc.). In the event that corrective action requests are not in complete accordance with approved project planning documents, the EPA will be consulted and concurrence will be obtained before the change is implemented. Corrective actions of this type will be documented by the Contractor QA Officer on a CAR and will be included in any subsequent reports.

4.3 Quality Assurance Reports to Management

After investigations are complete, Atlantic Richfield will prepare an annual DSR summarizing the sampling activities described in the QAPP. The laboratory turnaround time for providing sample results will be adequate to allow data review and completion of the annual DSR. The report will describe specific field activities performed during implementation of the QAPP and the physical characteristics of the study area. Each report will include field documentation, documentation of field QC procedures, and results of all field and laboratory audits. The report will also contain a discussion of the data quality assessment. The data quality discussions will contain, on a routine basis, the results of any associated field and laboratory audits, information generated on achieving specific DQOs and a summary of any corrective actions that were implemented and their immediate results on the project. A detailed listing of any deviations from the approved QAPP will also be provided with an explanation for each deviation and a description of the effect on data quality and usability, if any.

The CPM and Contractor QA Officer are responsible for preparing the report. The report will be submitted in draft form to the EPA for review. Upon receipt of comments, the draft report will be revised to address the comments and re-submitted to the EPA for final approval.

5.0 DATA REVIEW AND USABILITY

The following sections address the final project checks conducted after the data collection phase of the project is completed to confirm that the data obtained meet the project objectives and to estimate the effect of any deviations on data usability. In accordance with the *CFRSSI Data Management/Data Validation Plan Addendum* (AERL, 2000), the data review/validation process under this QAPP is streamlined to support the post-ROD decision-making process. The data compiled under this QAPP will be subject to Level A/B criteria review and validation per the EPA National Functional Guidelines and the project DQOs. Data review and validation will be conducted by a qualified technical consultant who is independent from the sampling consultant.

5.1 Data Review and Verification

The process to be used for reviewing and verifying field data and the internal laboratory data reduction process are described in the following sections. Laboratory data reporting requirements, which describe how results are conveyed to data users, are also discussed.

5.1.1 Field Data Review

Raw field data will be entered in field logbooks and/or field data sheets, which will be reviewed for accuracy and completeness by the Field Team Leader before those records are considered final. The overall quality of the field data from any given sampling round will be further evaluated during the process of data reduction and reporting. The field data will be reviewed by an independent party in accordance with Level A/B criteria that apply to sample collection and documentation records. Additionally, field data precision will be assessed by the independent party to verify collection of field duplicate samples in accordance with the specified frequency and to document data precision. The Level A/B Screening Checklist is included in Attachment F.

Field data reduction procedures will be minimal in scope compared to those implemented in the laboratory setting. Field data review will include verification that any QC checks and calibrations, if necessary, are recorded properly in the field logbooks and/or data sheets and that any necessary and appropriate corrective actions were implemented and recorded. Such data will be written into field logbook and/or data sheets immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. Later, the Field Team Leader will proof the field logbooks and/or data sheets to determine whether any transcription errors have been made by the field crew. If transcription errors have been made, the Field Team Leader and field crew will address the errors to provide resolution.

As appropriate, field measurement data will be entered into electronic files for import to the project database. Data entries will be made from the reviewed field data sheets or logbooks, and all data entries will be reviewed for accuracy and completeness by a separate party before the electronic file is provided to the database manager. Electronic files of field measurement data will be maintained as part of the project's quality records.

Results of the Level A/B criteria review will be included in annual DSR, which will provide a basis for meaningful interpretation of the data quality and evaluate the need for corrective actions.

5.1.2 Laboratory Data Review

Internal laboratory data reduction procedures will be according to each laboratory's Quality Management Plan. At a minimum, paper records will be maintained by the analysts to document sample identification number and the sample tag number with sample results and other details, such as the analytical method used (e.g., method SOP #), name of analyst, the date of analysis, matrix sampled, reagent concentrations, instrument settings and the raw data. These records will be signed and dated by the analyst. Secondary review of these records by the Laboratory

Supervisor (or designee) will take place prior to final data reporting to Atlantic Richfield. The laboratory is responsible for assigning appropriate flags/qualifiers in accordance with the analytical method and internal laboratory SOPs.

5.1.3 Laboratory Data Reporting Requirements

The laboratory will prepare hard copy data packages for transmittal of results and associated QC information to Atlantic Richfield or their designee. At a minimum, the data packages will include the case narrative, sample results, units and QC sample results.

The laboratory will prepare hard copy data packages for transmittal of results and associated QC information to Atlantic Richfield, or their designee, in general accordance with the *US EPA Contract Laboratory Program (CLP) Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration) ISM01.2* (EPA, 2010). Deviations from these specifications may be acceptable provided the hard-copy report presents all of the requested types of information in an organized, consistent and readily reviewable format.

5.1.4 Laboratory Electronic Data Deliverable

Each hard copy data package, as described above, will be accompanied by an EDD prepared by the laboratory. Additional laboratory QC data can be included in the EDD. The EDDs will be cross checked against corresponding hard copy data reports to confirm consistency in results reported in these two separate formats. This cross check will take place as part of the data review process.

5.1.5 Specific Quality Control/Assessment Procedures

Any qualification of the data resulting from the Level A/B criteria review or flags/qualifies identified by the laboratory will be incorporated into the project's electronic database so that all data users are aware of any uncertainties associated with individual results.

5.2 Internal Data Review

Data review is the process of verifying that information generated relative to a given sample is complete and accurate. Data review procedures will be performed for both field and laboratory operations as described below.

5.2.1 Field Quality Control Data

The results of field QC sample analyses associated with each laboratory data package will be reviewed to allow for evaluation of field duplicates and further indications of the data quality. If a problem is identified through the review of field QC data, all related field samples will be identified, and if possible, corrective actions can be instituted and documented on a CAR. In the event that corrective action requests are not in complete accordance with approved project planning documents, the EPA will be consulted and concurrence will be obtained before the change is implemented. If data are compromised due to a problem identified via field QC sample review, appropriate data qualifications will be used to identify the data for future data users.

The handling, preservation and storage of samples collected during the sampling program will be monitored on an on-going basis. The project laboratories will document sample receipt including proper containers and preservation at the time samples are logged in by the laboratory. The sample receipt records (a required data package deliverable), as well as the chain of custody documentation, will also be assessed during data review.

5.2.2 Laboratory Chemistry Data

The second level of review will be performed by the laboratory and will include a review of laboratory performance criteria. The laboratory data quality review will include verification of the following:

- Compliance with the QAPP;
- Holding times (maximum of 6 months for arsenic and lead in soil);
- Instrument calibration verification;
- Laboratory blank analysis;
- Detection limits;
- Laboratory duplicates;
- MS/MSD percent recoveries and relative percent differences;
- Surrogate percent recoveries; and
- Data qualifiers assigned by the laboratory.

Qualifiers that may be applied to the data include the following:

U The analyte was analyzed for but was not detected above the reporting limit.
J The analyte was positively identified; the associated numerical value is an estimate of the concentration of the analyte in the sample.
UJ The analyte was not detected above the sample reporting limit. However, the reporting limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

A Data Quality Assessment (DQA) will be performed to determine whether the project-specific DQOs have been satisfied. The DQA consists of five steps that relate the quality of the results to the intended use of the data:

Step 1: Review DQOs and sampling design.
Step 2: Conduct preliminary data review.
Step 3: Apply Statistical test(s) as described in this QAPP to the data se.t
Step 4: Verify assumptions.

Step 5: Draw conclusions about the quality of the data (data report will not include interpretation of results, but will state conclusions regarding the quality of the results).

If, as a result of the DQA process, it is determined that data do not satisfy all DQOs, then corrective action(s) should be recommended and documented in the data reporting. Corrective actions include, but are not limited to, revision of the DQOs, based on the results of the investigation, or collection of more information or data. It may be determined that corrective actions are not required, or the decision process may continue with the existing data, with recognition of the limitations of the data.

Results of the QA review and/or validation will be included in any subsequent report, which will provide a basis for meaningful interpretation of the data quality and evaluate the need for corrective actions.

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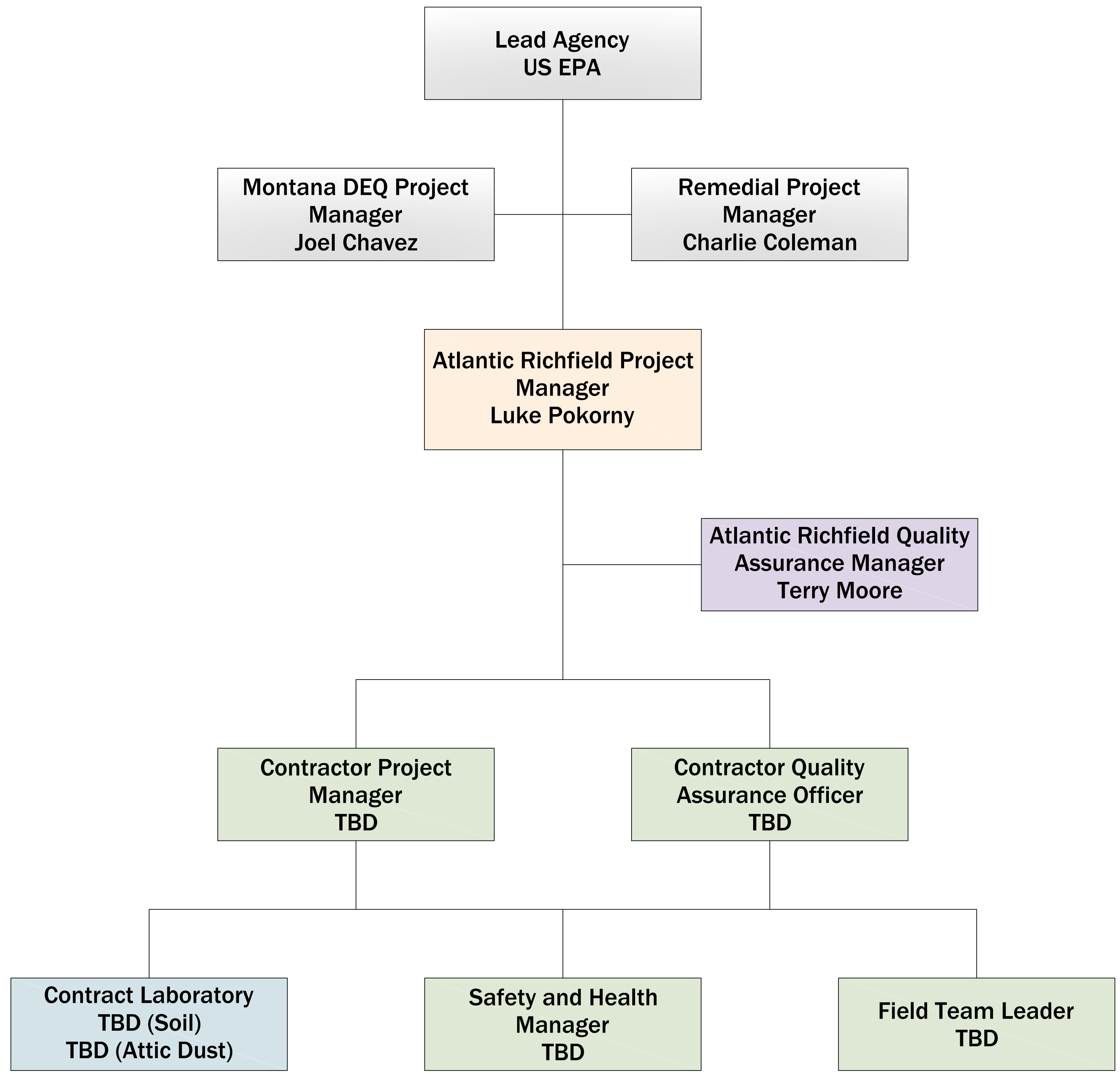
FIGURES



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DATUM: NA
UNITS: NA
SOURCE: PIONEER

SCALE IN FEET
0 NTS NTS

FIGURE 1

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

CSOU PROJECT ORGANIZATION CHART

DATE: 4/20/2015

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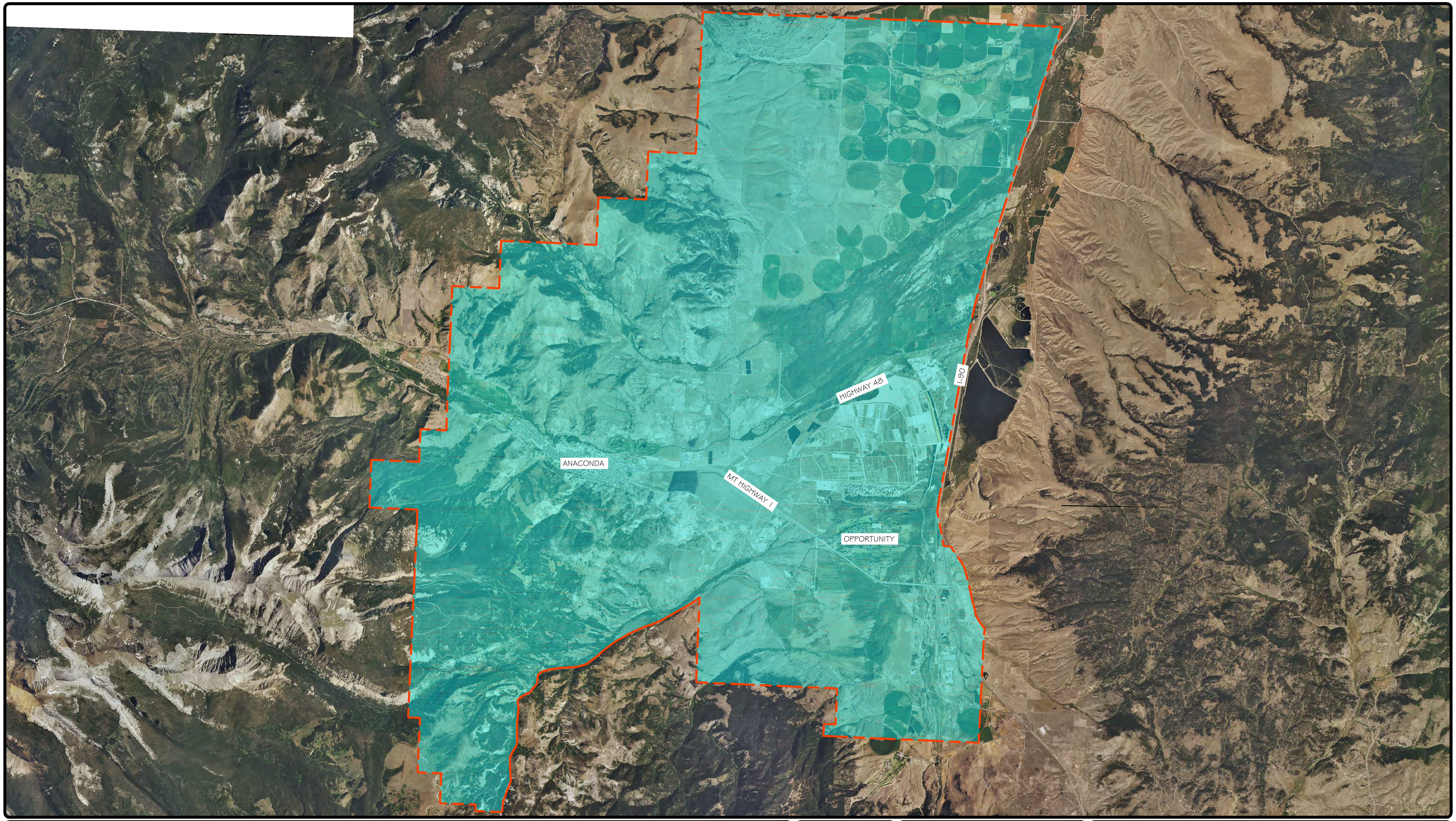

ADLC SUPERFUND PLANNING DISTRICT

N

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UNITS:	FEET
SOURCE:	PIONEER- NAIP

SCALE IN FEET
0 5000 10000

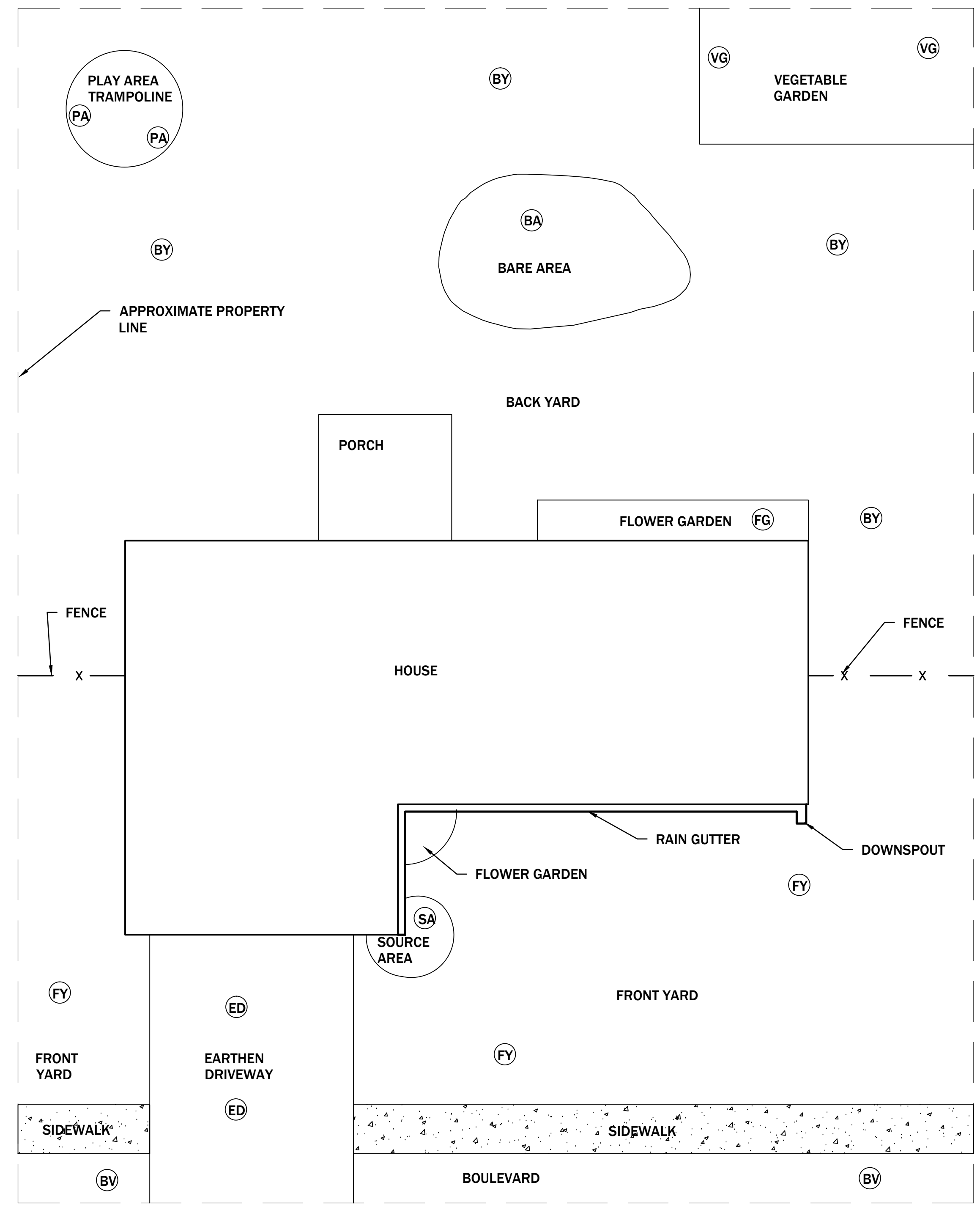
FIGURE 2

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

ALDC SUPERFUND PLANNING AREA OVERLAY DISTRICT (SPAOD)

DATE: 3-12-15

3/12/2015 12:24:19 PM \\192.168.252.15\PROJECT$\ANADATA\AR\CSOU\2014\DOCUMENTS\DRAFT CSOU RAWP FDR\CS OU FDR\CS OU QAPP\FIGURES\ADLC-SPD-FIG-001-14.DWG



LEGEND:

PROPERTY LINE	CONCRETE		
FENCE			
(FY) FRONT YARD SUBSAMPLE	(ED) EARTHEN DRIVEWAY SUBSAMPLE	(BV) BOULEVARD AREA SUBSAMPLE	
(BY) BACK YARD SUBSAMPLE	(BA) BARE AREA SUBSAMPLE	(PA) PLAY AREA SUBSAMPLE	
(VG) VEGETABLE GARDEN AREA SUBSAMPLE	(FG) FLOWER GARDEN SUBSAMPLE	(SA) SOURCE AREA SUBSAMPLE	

N

DISPLAYED AS:
COORD SYS/ZONE: NA
DATUM: NA
UNITS: NTS
SOURCE: PIONEER

SCALE IN FEET
0 NTS NTS

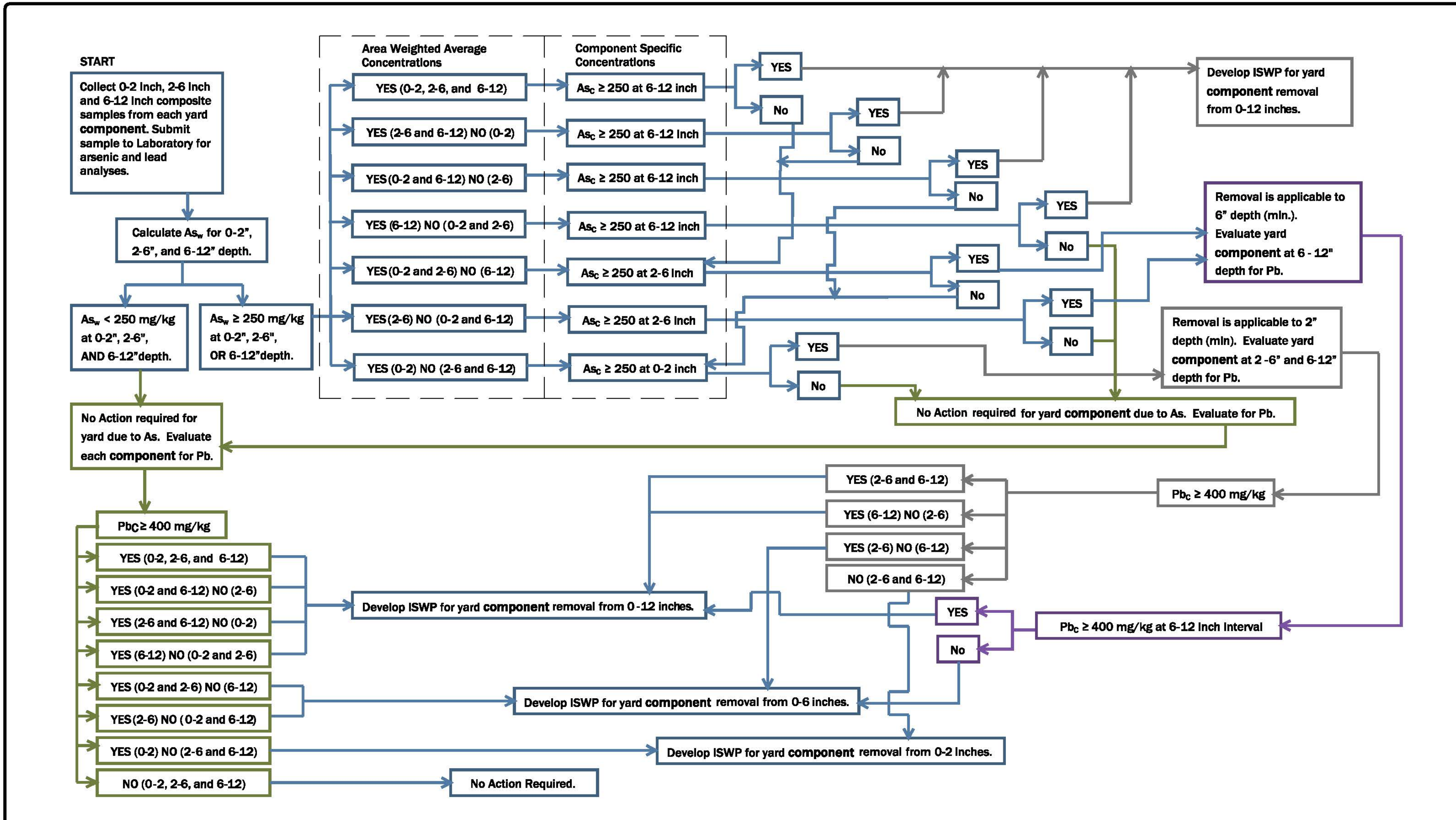
FIGURE 3

PIONEER TECHNICAL SERVICES, INC.
ANACONDA, MONTANA
307 EAST PARK, SUITE 421
(406) 563-9371

EXAMPLE RESIDENTIAL SOIL SAMPLE LOCATION MAP

DATE: 3-12-2015

3/12/2015 12:25:34 PM \\192.168.252.15\PROJECTS\ANADATA\AR\CSOU\2014\DOCUMENTS\DRAFT CSOU RAWP FDR\CS OU FDR\CS OU QAPP\FIGURES\BE-CSOU-FG-003-11.DWG



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches, an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:
SCALE IN FEET
0 NTS NTS

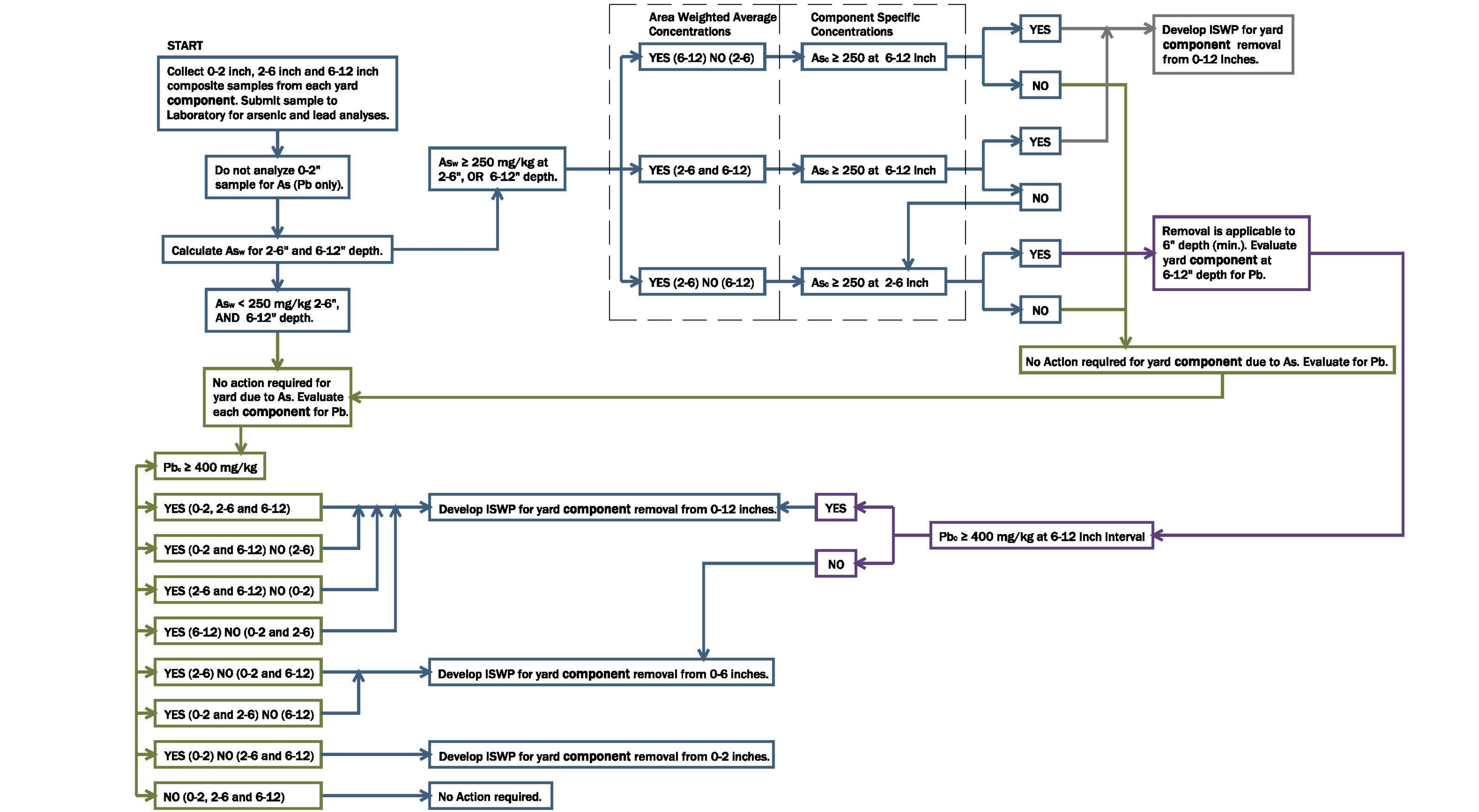
FIGURE 4

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

SAMPLING AND REMEDIAL ACTION FLOW CHART FOR RESIDENTIAL SOILS NOT PREVIOUSLY SAMPLED

DATE: 4/20/2015

4/24/2015 8:09:36 AM \\192.168.262.15\PROJECTS\ANADATA\AR\CSOU\2015\DOCUMENTS\DRAFT FINAL CS OU FDR (TO EPA 4-XX-15)\APPENDIX E – QAPP\FIGURES\CSOU SAMPLING PLAN 4.DWG



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches, an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

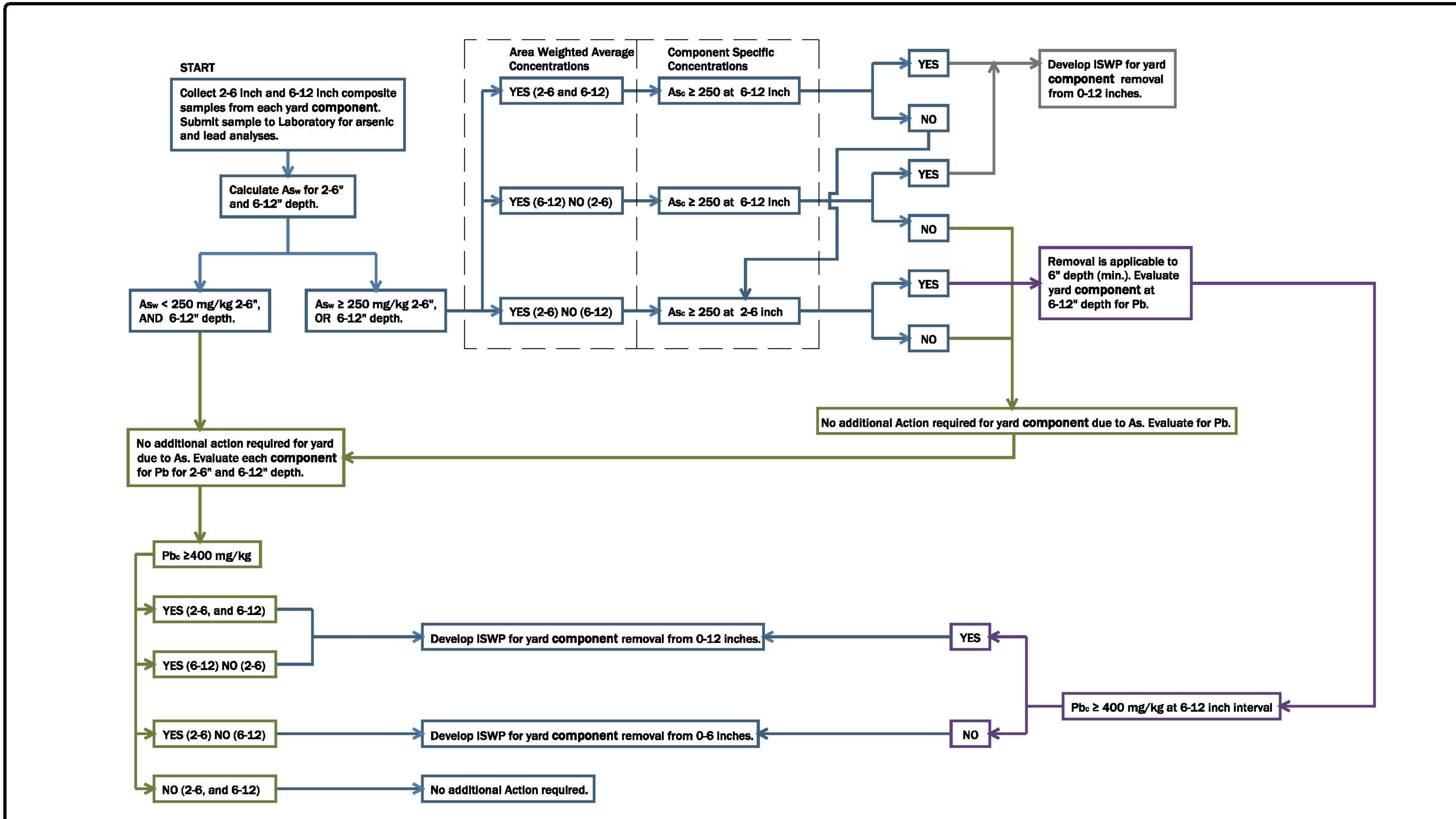
DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:
SCALE IN FEET
0 NTS NTS

FIGURE 5

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY SAMPLED BUT NOT SUBJECT TO RA

DATE: 4/20/2015



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:

SCALE IN FEET
0 NTS NTS

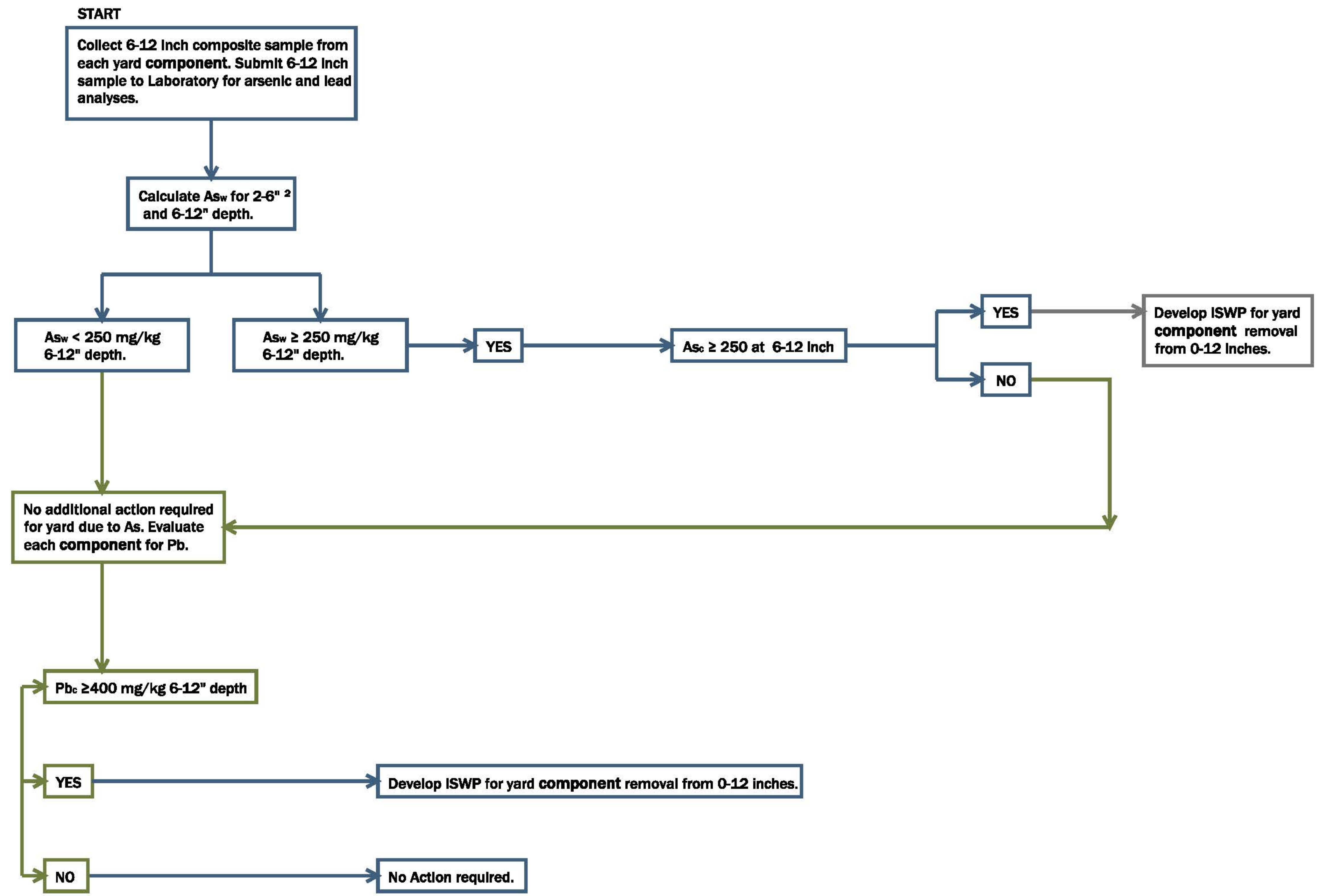
FIGURE 6

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY REMEDIATED AT 0" - 2" DEPTH

DATE: 4/20/2015

4/24/2015 8:11:25 AM \\192.168.262.15\PROJECTS\ANADATA\AR\CSOU\2015\DOCUMENTS\DRAFT FINAL CS OU FDR (TO EPA 4-XX-15)\APPENDIX E – QAPP\FIGURES\CSOU SAMPLING PLAN 6.DWG



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. When calculating the arsenic area weighted average, in previously remediated components, an average arsenic concentration of 19.1 mg/kg will be applied to all previously placed clean cover soil.
3. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

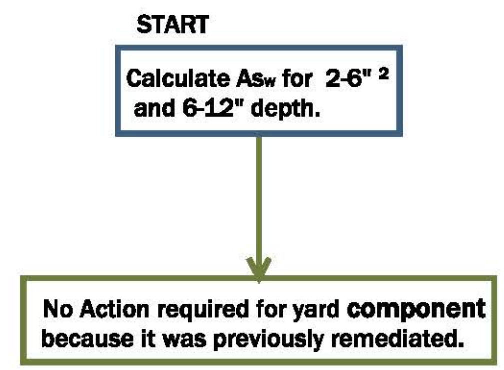
DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:
SCALE IN FEET
0 NTS NTS

FIGURE 7

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY REMEDIATED AT 0" - 6" DEPTH
DATE: 8/7/2015

8/4/2015 12:32:21 PM \\192.168.262.15\PROJECTS\ANADATA\AR\CSOU\2015\DOCUMENTS\DRAFT FINAL CS OU FDR (TO EPA 6-1-16)\APPENDIX E – QAPP\QAPP FIGURES\CSOU SAMPLING PLAN 7.DWG



LEGEND:
Pb: Lead
As: Arsenic
As_w: Arsenic Area-Weighted Average Concentration
As_c: Arsenic Component Specific Concentration
Pb_c: Lead Component Specific Concentration
ISWP: Individual Site Work Plan

NOTES:
1. For those properties previously sampled at 0-2 inches an arsenic area-weighted average currently exists. This area-weighted average will not be recalculated.
2. When calculating the arsenic area weighted averages, in previously remediated components, an average arsenic concentration of 19.1 mg/kg will be applied to all previously placed clean cover soil.
3. For vegetable gardens and flower gardens this flow chart will need to be followed in a similar progression, beginning with the 18-24 inch and 12-18 inch depth intervals.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:

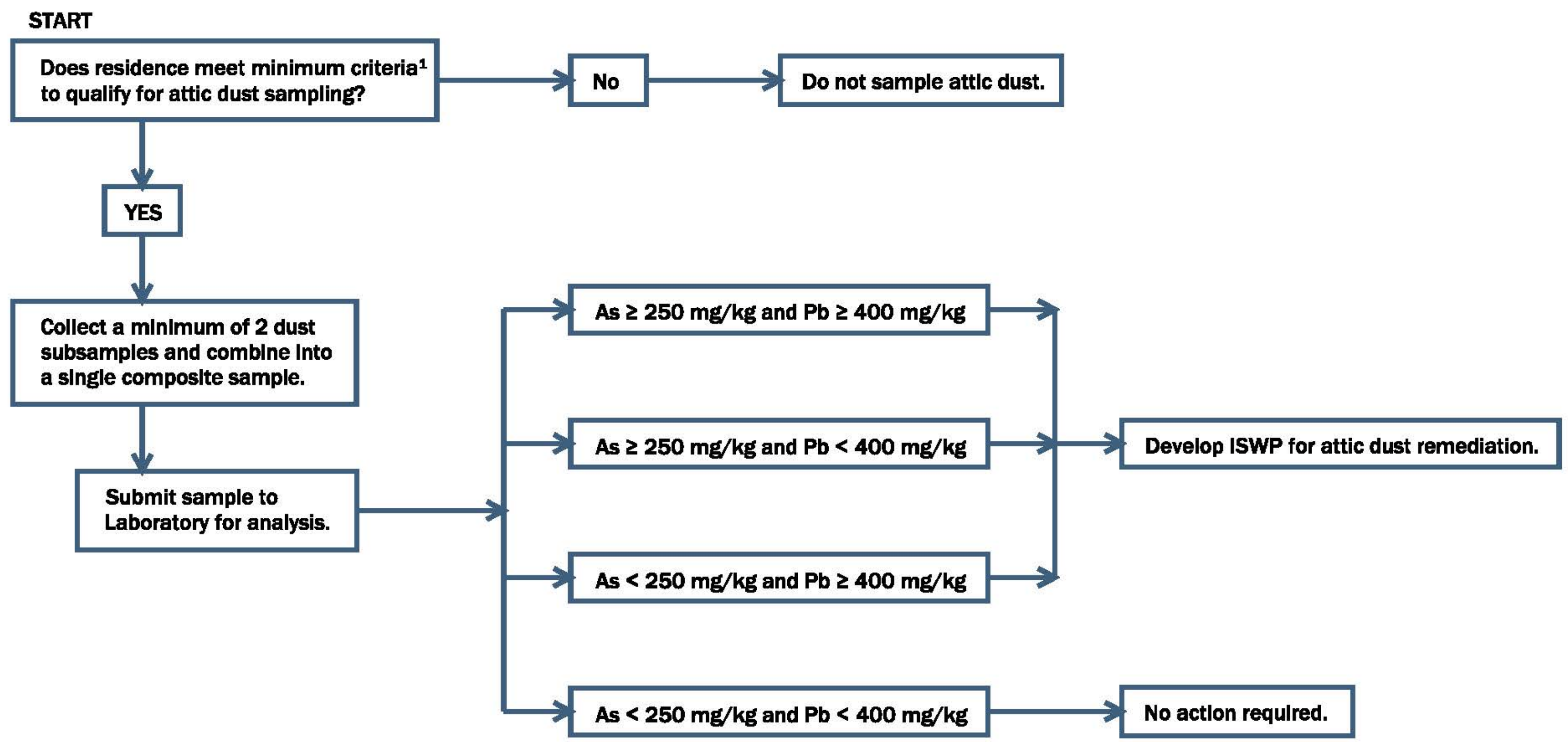
SCALE IN FEET
0 NTS NTS

FIGURE 8

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

YARD SAMPLING FLOW CHART FOR COMPONENT PREVIOUSLY REMEDIATED AT 0" - 12" DEPTH

DATE: 8/7/2015



LEGEND:

Pb: Lead

As: Arsenic

ISWP: Individual Site Work Plan

1 - Criteria to qualify for attic dust sampling is detailed in RAWP/FDR text, Section 3.2 Attic Dust.

DISPLAYED AS:
COORD SYS/ZONE:
DATUM:
UNITS:
SOURCE:

SCALE IN FEET
0 NTS NTS

FIGURE 9

SAMPLING AND REMEDIAL ACTION FLOW CHART FOR ATTIC DUST

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

DATE: 4/20/2015

TABLES

TABLE 1: CS OU PROJECT SCHEDULE

Dates:	Tasks:
2nd Quarter 2015	Submit Draft Final CS OU Residential Soils/Dust RAWP/FDR to Agencies for review and approval.
3rd Quarter 2015	Submit Agency approved Final CS OU Residential Soils/Dust RAWP/FDR.
3rd Quarter 2015	Initiate access agreement process for those residences that have soil lead data exceeding the action limit as well as those that have requested sampling[1].
4th Quarter 2015 – 2021	Perform soil and attic dust sampling activities[2] (pending receipt of completed access agreements).
2nd Quarter 2016 – 2021	Perform remedial action activities[3].

[1] – Soil and dust sampling requests will be accepted until December 31, 2020. Past this date, additional sampling requests will be addressed by Atlantic Richfield or its contractor in accordance with the requirements of the Institutional Controls Implementation and Assurance Plan (ICIAP).

[2] – After data validation activities are completed, results for all analysis (arsenic and lead) will be reported to each individual landowner as well as the Agencies.

[3] – This schedule will allow the CS OU sampling and RA program to be subject to an Agency 5-year review.

TABLE 2: PRECISION, ACCURACY AND COMPLETENESS CALCULATION EQUATIONS

Characteristic	Formula	Symbols
Precision (as relative percent difference, RPD)	$RPD = \frac{(x_i - x_j)}{\left(\frac{x_i + x_j}{2}\right)} \times 100$	x_i, x_j: replicate values of x
Precision (as relative standard deviation, RSD, otherwise known as coefficient of variation)	$RSD = \frac{\sigma}{\bar{x}} \times 100$	σ: sample standard deviation $\bar{x}$: sample mean
Accuracy (as percent recovery, R, for samples without a background level of the analyte, such as reference materials, laboratory control samples and performance evaluation samples)	$R = \frac{x}{t} \times 100$	x: sample value t: true or assumed value
Completeness (as a percentage, C)	$C = \frac{n}{N} \times 100$	n: number of valid data points produced N: total number of samples taken

Table 3: Example Arsenic Area Weighted Average Calculation

Residential yard sampling

	Yard Components[a]	Total Area of Component[a] (square feet)	Number of Subsamples[b]	Percentage of Yard Area	Component Concentration[a] (mg/kg)	Fraction of Yard	Composite Concentration[c] (mg/kg)
FY	Front yard	1,875	3	36%	240	0.36	85.6
BY	Back yard	2,250	4	43%	210	0.43	89.8
VG	Vegetable Garden	300	2	5.7%	83	0.057	4.7
ED	Earthen driveway	425	2	8.1%	117	0.081	9.5
SA	Source area	225	2	4.3%	630	0.043	26.9
BA	Bare area	175	1	3.3%	390	0.033	13.0
BV	Boulevard	10	1	0.19%	255	0.0019	0.48
	Total	5,260	15	100%		1.0	230

Note: [a] These are for example purposes only and are not based on site data.

[b] Number of subsamples required to achieve a sampling density of at least 1 sample per 625 square feet of area per CSOU-SOP-S-04. Multiple subsamples will be homogenized in the field and a single composite sample submitted to the laboratory for analysis.

[c] Composite concentration is the sum of the area-weighted concentrations (component concentration * fraction of yard)

ATTACHMENT A

STANDARD OPERATING PROCEDURES

Attachment A-1:	**CS OU Field Standard Operating Procedures**
Attachment A-2:	**Soil Laboratory Standard Operating Procedures**
Attachment A-3:	**Attic Dust Laboratory Standard Operating Procedures**

ATTACHMENT A-1

CS OU FIELD
STANDARD OPERATING PROCEDURES

Attachment A-1
CS OU Field SOP
Index

SOP Number	SOP Title	# Pages	Equivelant CFRSSI SOP
CSOU-SOP-S-01	Surface Soil Sampling	4	SS-4 Residential Yard/Lot Soil Sampling Procedures; SS-6 Compositing Soil Samples
CSOU-SOP-S-04	Residential Yard/Lot Soil Sampling	8	SS-4 Residential Yard/Lot Soil Sampling Procedures; SS-6 Compositing Soil Samples
CSOU-SOP-S-06	Test Pit Sampling	4	SS-4 Residential Yard/Lot Soil Sampling Procedures; SS-6 Compositing Soil Samples
CSOU-SOP-D-01	Attic Dust Sampling with a Micro-Vacuum	11	-
CSOU-SOP-SA-01	Soil Sample Packaging and Shipping	2	G-5 Sample Packaging and Shipping
CSOU-SOP-SA-03	Field Quality Control Samples	1	SS-4 Residential Yard/Lot Soil Sampling Procedures; SS-6 Compositing Soil Samples
CSOU-SOP-SA-04	Chain of Custody Forms for Environmental Samples	3	G-7 Sample Custody
CSOU-SOP-SA-05	Project Documentation	2	G-4 Field Logbook/Photographs
CSOU-SOP-DE-01	Personnel Decontamination Procedures	5	G-8 Decontamination of Equipment used to Sample Soil and Water
CSOU-SOP-DE-02	Equipment Decontamination	3	G-8 Decontamination of Equipment used to Sample Soil and Water

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-S-01
SURFACE SOIL SAMPLING

A surface sample is defined as a mineral soil sample collected from immediately beneath the vegetative mat. It generally includes some interval from the upper six inches of soil. Surface sampling under biased conditions may be selected after considering factors such as type of contaminant, length of time the area has been contaminated, the type of soil and the past use of the area.

GRAB SAMPLE:

Sample collection devices include stainless steel scoops or trowels, disposable Teflon trowels or for inorganic contaminants disposable plastic scoops. The following procedure is designed to be used to collect a surface soil sample from the 0-2 inch horizon. These procedures may be modified in the field based on field and site conditions after appropriate annotations have been made in the field log book. These procedures are **not to** be used when sampling for volatile organic compounds. The procedure for collecting volatile organic samples is included in Section 3 of this SOP.

1. Locate the site as directed in the appropriate Quality Assurance Project Plan (QAPP).

2. Complete a site walk through and determine any site specific hazards associated with the sampling area. Discuss with sampling crew and note in the field logbook. During the site walk through, note possible locations for underground utilities. As an example identify where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. Determine if an underground sprinkling system is present. If sample locations have not been assigned in the QAPP, note the probable locations of underground utilities and try to avoid those areas when choosing sample locations. If sample locations are identified in the QAPP use the appropriate survey method to locate.

3. Dig a 6 to 12-inch square pit to a depth of approximately 6 inches. The size and depth of the sample pit required would depend on the amount of material needed for sample analysis and the interval to be sampled. If a sod mat is present, it shall be separated from the mineral soil surface with the chosen sampling tool. The removed sod mat shall be shaken and scraped over the sample collection bowl to dislodge any mineral soil particles. All dislodged particles shall be placed in the sample. If the surface material is coarse-grained material free of intermixed materials (i.e., graveled driveway) the sample will be collected from the layer below the protective barrier. However, if the graveled driveway, alley or lot contains soil/dust material on the surface the sample will be collected from the appropriate interval. If the sample area is unvegetated the sample material will be collected from the designated depth intervals below ground surface.

4. Measure the interval to be sampled (0-2 inches or 0-6 inches) with a stainless steel tape measure or a ruler and mark the appropriate interval.

5. Scrape the walls of the sample pit within the marked interval with a decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop to expose a clean surface.

6. Once the wall of the test pit has been cleaned, collect the sample by scraping the appropriate interval on the cleaned face of the pit with the sampling tool and placing the material in a decontaminated stainless steel bowl, or a new cleaned foil pan.

7. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool.

8. Transfer the soil sample directly into the appropriate sample container according to Community Soils Operable Unit Standard Operating Procedure (*Soil and Water Sample Packaging and Shipping*) (CSOU-SOP-SA-01) and store in a cooler at 4°C or less.

9. Record appropriate information about the sample collection in the field logbook.

10. Decontaminate sampling tools according to procedures outlined in Community Soils Standard Operating Procedure (*Equipment Decontamination*) (CSOU-SOP-DE-02).

COMPOSITE SAMPLING

In many situations a composite sample is more appropriate for sample collection than a grab sample. Several types of composite samples can be collected. A biased composite sample can be collected by the sampler identifying specific spots within the sample area that appear to be contaminated or not contaminated and digging sample pits in those locations. Composite samples can also be collected randomly as defined in the QAPP.

Sub samples are often collected in a five-point (star) pattern. At each point, a subsample of a predetermined depth is collected. The diagonal distance between points is commonly ten feet depending on the area of soil homogeneity. Sub samples can also be collected in a three-point (triangular) pattern. At each point, a subsample of predetermined depth is collected. The diagonal distance between the points is commonly ten feet depending on the area of soil homogeneity. The precise method for compositing the sample will be discussed in the QAPP. Each subsample test hole will be prepared and sampled in the manner discussed above under Grab Samples.

1. Composite samples will consist of discrete aliquots of equal amounts of soil from each subsample location. The soil aliquots will be collected into a stainless steel bowl and thoroughly mixed. During the homogenization process, large particles (greater than 0.5 inch in diameter) will be discarded. After mixing, the sample will be placed in a one quart plastic bag, labeled, stored in a cooler with ice and maintained at 4 degrees Celsius (°C) until delivered to the laboratory. Any remaining sample material will be returned to

the sample holes. A sufficient quantity of soil will be collected in each sample container to provide for analysis with additional soil left over to be archived. An alternative method of compositing soil subsamples is with a large disposable plastic or canvas sheet. The subsamples are mixed in the center of the sheet. Each corner is pulled up and toward the diagonally opposite corner. This process is done from each corner. After the soil is mixed, it is again spread out on the cloth into a relatively flat pile. The pile is quartered. A small scoop is used to collect small samples from each quarter until the desired amount of soil is acquired. Note: High concentrations of organic chemicals in soils can react with the plastic sheet. The sampler may also "eyeball" an equal amount of sample material from each hole into a resealable plastic bag (i.e. Ziploc®). The sample material would be thoroughly mixed between each subsample pit and prior to placing in the appropriate sample containers.

2. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool.

3. Transfer the soil sample directly into the appropriate sample container according to Community Soils Operable Unit Standard Operating Procedure (*Soil and Water Sample Packaging and Shipping*) (CSOU-SOP-SA-01) and store in a cooler at 4°C or less.

4. Record appropriate information about the sample collection in the field logbook.

5. Decontaminate sampling tools according to procedures outlined in Community Soils Operable Unit Standard Operating Procedure (*Equipment Decontamination*) (CSOU-SOP-DE-02).

VOLATILE ORGANIC SAMPLING

1. Locate the site as directed in the appropriate QAPP.

2. Do a site walk through and determine any site specific hazards associated with the sampling area. Discuss with sampling crew and note in the field logbook. During the site walk through note possible locations for underground utilities. As an example identify where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. If sample locations have not been assigned in the QAPP, note the probable locations of underground utilities and try to avoid those areas when choosing sample locations. If sample locations are identified in the QAPP use the appropriate survey method to locate.

3. Dig a 6 to 12-inch square pit to a depth of approximately 6 inches. The size and depth of the sample pit required would depend on the amount of material needed for sample analysis and the interval being sampled. If a sod mat is present, it shall be separated from the mineral soil surface with the chosen sampling tool. The removed sod mat shall be shaken and scraped over the sample collection bottle to dislodge any mineral soil particles. All dislodged particles shall be placed in the sample. If the surface material is coarse-grained material free of intermixed materials (i.e., graveled driveway) the sample

will be collected from the appropriate layer below the protective barrier. However, if the graveled driveway, alley or lot contains soil/dust material on the surface the sample will be collected from the appropriate interval. If the sample area is unvegetated the sample material will be collected from appropriate depth below ground surface.

4. Measure the interval to be sampled (0-2 inches or 0-6 inches) with a stainless steel tape measure or a ruler and mark the appropriate interval.

5. Scrape the walls of the sample pit within the marked interval with a decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop to expose a clean surface.

6. After the face of the test pit has been cleaned either immediately place the sampling container into the sample pit and collect the sample by scraping the appropriate interval of mineral soil directly into the sample container, material should be packed in as tightly as feasible and the sampler should try to avoid getting large particles in the jar. The sampling container should be filled to the top with little to no headspace and the lid placed on the container as soon as the jar is full. The sample should be placed immediately in a cooler at 4ºC or less.

7. Record appropriate information about the sample collection in the field logbook.

8. Decontaminate sampling tools according to procedures outlined in Community Soils Operable Unit Standard Operating Procedure (*Equipment Decontamination*) (CSOU-SOP-DE-02).

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-S-04
RESIDENTIAL YARD/LOT SOIL SAMPLING

The purpose of this standard operating procedure (SOP) is to ensure that a consistent sampling approach is used at Superfund Sites for the delineation of residential areas that may require remediation to protect the public health. This SOP is applicable to areas within a residential tract such as yards, vacant lots, playgrounds, parks, and other areas in and adjacent to residential yards (yards/lots).

INTRODUCTION

Prior to the use of this SOP, other less intensive sampling designs may be required to indicate the need for sampling at this scale. Sampling performed according to this SOP will supply yard/lot-specific analytical data from which remedial action decisions can be made. If remedial action is necessary, either the property boundary or a smaller natural boundary within the yard/lot will be used to establish the area of remediation. Soil sampling conducted to determine whether a remedial action is necessary in the "use areas" utilized these boundaries to delineate the sample areas.

Samples representing use areas such as half yards/lots, gardens/flowerbeds, earthen driveways, rock gardens, play areas, bare areas, earthen driveways, and opportunity areas (e.g., areas underneath a porch at a residence with children and pets), and source areas are collected in suspect residential areas. Composite sampling is used to characterize the average concentration of inorganic constituents of concern in the use areas. The number of subsamples comprising a composite sample and the total area composited is standardized to limit sampling to similar sized areas for comparative purposes.

SAMPLING APPROACH

The approach to yard/lot sampling is based on composite sampling of selected use areas of a residential yard/lot. The composite sample best represents constituent concentrations within a use area by averaging subsamples collected at locations that spatially represent the area.

COMPOSITE SAMPLE AREAS

Composite sample areas within a yard/lot will be selected prior to sampling. These sampling areas are determined by using natural boundaries which divide the use areas of a yard/lot. Boundaries may include property or fence lines, front and back yard divisions, driveways, and
vegetable and flower garden boundaries. The following use areas are considered separate composite sample areas.

YARD/LOT COMPOSITES

Yards are divided into front and back yard composite sample areas. This is the only division for sampling and removal in yards unless a front or back yard exceeds 5,000 square feet or if it contains selected smaller use areas such as gardens, earthen driveways, play areas, bare areas, opportunity sampling areas, or source areas described below.

Lot areas (vacant lots, playgrounds, parks, and other adjacent areas) exceeding 5,000 square feet in size, will be divided up into equal sized areas for sampling and removal purposes. The sample collection density and depth intervals should be carried out in accordance with the "yard/lot composite" sections. Smaller selected use areas such as gardens, earthen driveways, play areas, bare areas, opportunity sampling areas, or source areas are applicable as described below.

VEGETABLE AND FLOWER GARDEN COMPOSITE

Subsamples are collected in the vegetable gardens (i.e., areas where vegetables are grown for the intent of consumption) and flower gardens (i.e., areas where flowers are grown for aesthetic purposes) within a yard and combined into composite samples. The garden samples are collected separately because of the potential increased exposure of residents to soil through normal gardening activities. The garden soils may also differ from the yard soils.

PLAY AREA COMPOSITE

Subsamples are collected in the play areas within a yard and combined into composite samples. The play area subsamples are collected separately because of the potential increased exposure of children to soil through play-time activities as play areas often contain minimal vegetation and areas of exposed soil.

EARTHEN DRIVEWAY COMPOSITE

The earthen driveway composite sample is separate from the yard composite. This area is sampled separately because the driveway material may differ from the yard soil in type and origin. This method will allow for separate remediation decisions based on the concentrations of constituents of concern in each composite sample.

SOURCE AREA COMPOSITE

A composite sample is collected in potential source areas (waste rock piles, mine dumps, etc.) within yards or residential lots. This composite sample characterizes the surface material in the source areas where direct exposure to residents may occur and identifies the potential effect of the source area on the yard or residential lot through runoff.

In cases where a potential source area is contained within two or more yard or lot boundaries, these property boundaries are used as sampling limits when selecting subsample sites for the source area composite. Characterization sampling of a potential source area for purposes of determining environmental risk is outside the scope of this

SOP.

OPPORTUNITY COMPOSITE

Subsamples are collected in the areas within a yard where dissimilar materials are noted and combined into composite samples. The opportunity samples are collected separately because of the material differences between the noted materials and the yard soils.

SAMPLE COLLECTION

Samples will be collected as use area composites described previously. Subsample density and locations within the composite areas are determined based on the size of the area to be represented by the subsample, and specific locations within the composite areas that may require sampling. The depth interval from which samples are collected within the composite area is dependent on the area type. Subsample density, location, and depth intervals are discussed in the following sections.

SUBSAMPLE DENSITY AND LOCATION

A minimum of two and a maximum of eight subsamples are collected for any composite sample. The subsample density is determined by the type of composited area. The area represented by a subsample will necessarily decrease where the composite area is small or where other natural boundaries require additional subsamples to spatially represent the composite area. Subsample density and locations are discussed below.

YARD/LOT COMPOSITES

Yard/lot composite subsamples are collected at a density of approximately one for every 625 square feet (25 feet by 25 feet) of front or back yard area as determined through conventional or GPS survey. The subsamples are located within the yard/lot area to be spatially representative.

Using this density, subsamples are collected at selected locations within the yard/lot to characterize the yard/lot with respect to specific areas where constituents of concern may be concentrated or may be most exposed to residents. These areas are roof drip lines where no collection gutter exists, topographically low areas, play areas, bare areas, areas adjacent to downspouts, or areas that are near a potential source such as a waste rock dump. These subsample locations are selected to best fit the established yard/lot composite subsample density.

VEGETABLE AND FLOWER GARDEN COMPOSITE

Vegetable and flower garden composite samples include at least two subsamples per total garden area and a maximum of eight subsamples. All garden areas of reasonable size will be included in the composite. Subsample density is approximately one for every 100 square feet.

PLAY AREA COMPOSITE

Play area composite subsamples are collected at the same approximate density as subsamples for a yard component (1 for every 625 square feet). A minimum of two and a maximum of eight subsamples will be composited. The subsample sites should be equally spaced within the play area. All play areas of reasonable size will be included in the composite.

EARTHEN DRIVEWAY COMPOSITE

Subsamples are collected in earthen driveways at the same approximate density as subsamples for a yard composite (1 for every 625 square feet). A minimum of two subsamples and a maximum of eight will be composited. The subsamples sites should be equally spaced within the earthen driveway and areas where noticeable fuel or oil spills have occurred should be avoided.

SOURCE AREA COMPOSITE

Potential source area composite subsamples will be collected at the same approximate density as yard/lot composite subsamples (1 for every 625 square feet of source area). Again, a minimum of two subsamples and a maximum of eight will comprise the composite sample. The subsample sites should be equally spaced within the source area.

OPPORTUNITY COMPOSITE

Opportunity composite subsamples will be collected at the same approximate density as yard/lot composite subsamples (1 for every 625 square feet of source area). A minimum of two and a maximum of eight subsamples will comprise the composite sample. The subsample sites should be equally spaced within the area from which the opportunity sample is being taken.

SAMPLING DEPTH INTERVALS BY COMPOSITE AREA

This SOP addresses residential yard or lot sampling to decide whether a remedial action is required in the yard or lot. The depth of sampling in a yard/lot is determined by the potential for exposure of residents to soil through everyday activities. The depth of the remediation within a yard/lot will be determined using data from other large scale sampling efforts that will characterize the depth of constituents of concern in the soil and determine their origin and mode of transportation. For example, where an area has been subjected to outfall constituents, only surficial soil removal or capping may be required to mitigate the exposure. In contrast, an area where the soil has been mixed with mine waste rock or mill tailings, a deeper removal or capping effort or both may be required.

All subsample locations will be plotted on the map representing each residential yard. Photographs will be taken of yard components and any unusual features, as deemed necessary by field personnel. All information will be recorded on field data sheets and/or in the field logbook.

SAMPLE DEPTHS

Most residential yard/lot areas are expected to be covered with grass; consequently, a surface sample will be collected from immediately beneath the vegetative mat, or in the absence of vegetation, 0 to 2 inches bgs. If a vegetative mat (sod) is present, it will be separated from the soil surface with a stainless steel knife or equivalent. The removed vegetative mat will be shaken and scraped over the sample collection bowl to dislodge any soil particles. All dislodged particles will be placed in the sample.

Exceptions to this procedure will occur when the sample location falls on a graveled driveway or similar surface. If the surface material is coarse-grained material free of intermixed materials, the sample will be collected from the 0- to 2-inch soil layer immediately beneath the coarse-grained material. However, if the graveled driveway or similar surface contains soil/dust material on the surface, the sample will be collected from the surface, 0- to 2-inch layer.

Subsurface samples from the front yard, back yard, side yard (as applicable), play areas, unpaved driveways, gardens, drip zones and bare areas will be collected from the following depth intervals: 2 to 6 inches bgs and 6 to 12 inches bgs. Decisions regarding collection of additional "opportunistic" samples will be made in the field by sampling personnel and/or Agency personnel.

Subsurface samples from vegetable and flower gardens will be collected from the following depth intervals: 2 to 6 inches bgs; 6 to 12 inches bgs; 12 to 18 inches bgs; and 18 to 24 inches bgs.

SAMPLE DENSITY, LOCATION, AND COMPOSITING

One subsample per individual yard component (e.g., front yard, back yard, garden, etc.) will be collected unless the component is greater than 625 square feet (ft2) (25 feet by 25 feet) in surface area. If the yard component exceeds 625 ft2, additional subsamples will be collected to meet the sample collection density of 1 subsample for each 625 ft2 (in accordance with the project- specific approved SAP). For gardens, earthen driveways, and source areas (areas of visible smelter-related waste material), a minimum of two subsamples will be collected regardless of the surface area involved. A single composite sample representing each individual yard component and depth interval will be submitted to the laboratory for analysis. The sampler will record any unusual soil properties, such as bare surface conditions, presence of foreign materials, staining, etc. Additionally, for gardens, the type of garden will be noted in the field logbook during sampling. Non-drip zone samples will be located outside of the drip zone and away from influences of any other painted surfaces; otherwise, the presence of paint chips in the sample area (or presence of deteriorating paint on siding, foundations, etc.) will be noted if space is not available to avoid these areas. Each composite sample will consist of equal aliquots of soil collected from the corresponding depth interval in adjacent sample locations representing a common yard component.

Subsamples will be collected from within the drip zone of each residence if possible (i.e., at times concrete or other obstruction makes it impossible to gather a subsample within the drip zone). The drip zone subsamples will be included in the nearest component's composite sample. Distinct drip zone samples will not be collected. The drip zone subsample locations will be situated, generally, between 6 and 30 inches from the exterior of the house and near the mid-point of each side of the house. Subsamples will be collected from within rock gardens of each residential property (if applicable). The rock garden subsamples will be included in the nearest component's composite sample. Disting rock garden samples will not be collected. Additionally, composite samples will be collected from distinct play areas, vegetable gardens, and unpaved driveways. These composite samples will consist of a minimum of two subsamples (see note above) collected from the corresponding depth intervals.

Composite samples will consist of discrete aliquots of equal amounts of soil from each depth interval for a given component of a residential yard. The soil aliquots will be collected into a stainless steel bowl and thoroughly mixed. During the homogenization process, large particles (greater than 0.5 inch in diameter) will be discarded. After mixing, the sample will be placed in a one quart plastic bag, labeled, stored in a cooler with ice and maintained at 4 degrees Celsius (°C) until delivered to the laboratory. Any remaining sample material will be returned to the sample holes. A sufficient quantity of soil will be collected in each sample container to provide for analysis with additional soil left over to be archived. All of the samples (100%) will be archived through the duration of the holding time.

If the EPA (or the EPA Contractor) chooses to collect split samples, an adequate quantity of soil will be made available by the sampler at the time of sample collection. However, the EPA (or EPA Contractor) will be responsible for providing sample containers and coolers, etc., for storing and shipping split samples. These items will not be provided by the samplers.

YARD/LOT COMPOSITES

The top two inches of soils is where the primary exposure to residents occurs in yard/lot areas. Most yard/lot areas are covered with grass that generally limits exposure to deeper soils. Because of this exposure buffer, front or backyard composite samples are collected as surface samples. A surface sample is defined as a mineral soil sample collected from zero to two inches immediately below the vegetative mat, or in the absence of vegetation, zero to two inches bgs. Subsample intervals for yard/lot composite areas can be taken at intervals of 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches bgs.

VEGETABLE AND FLOWER GARDEN COMPOSITE

The deepest potential exposure of residents to soils in a yard occurs in the garden areas. During normal gardening activities, the soil is tilled and cultivated, and is generally in physical contact with residents. Normal tilling depths are 12 inches or less, but infrequent work may occur at greater depth so subsample intervals for garden areas can be taken at 0 to 2 inches, 2 to 6 inches, 6 to 12 inches, 12 to 18 inches, and 18 to 24 inches bgs. Garden samples are taken using sampling procedures that are best fit to the soil type and obtain and adequate volume of soil for analytical and archiving purposes.

PLAY AREA COMPOSITE

The greatest potential risk to exposure of residents to material within a play area is at the material surface, however infrequent activities such as digging in play areas may results in contact at greater depth. Play area subsamples can be taken at depths of 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches bgs.

EARTHEN DRIVEWAY COMPOSITE

Earthen driveways are generally well-compacted due to driveway use. Compaction usually reduces the exposure to the deep sections of soil beneath a driveway, however infrequent work may result in resident contact with deeper soils. Earthen driveway subsamples can be taken at 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches bgs.

SOURCE AREA COMPOSITE

The greatest potential risk to exposure of residents to material within a potential source area is at the material surface. Exposure may occur through direct contact with the material, or areas affected by erosional re-deposition onto an adjacent surface of the yard/lot as well as contact with at great depth if infrequent digging activities occur. Therefore, subsamples comprising the source area composite can be taken at 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches bgs.

OPPORTUNITY COMPOSITE

The greatest potential risk to exposure of residents to material within an area from which an opportunity sample is collected is at the material surface. Exposure may occur through direct contact with the material, or during infrequent digging activities. Therefore, subsamples comprising the opportunity composite can be taken at 0 to 2 inches, 2 to 6 inches, and 6 to 12 inches bgs.

SAMPLING AND COMPOSITING

All surface samples will be collected at the previously determined locations in accordance with the procedures outlined in the Community Soils Operable Unit (CS OU) Standard Operating Procedure (SOP)-S-01 (*Surface Soil Sampling*), or the site-specific SAP. Garden samples will be collected using sampling procedures that will best fit the soil type and obtain an adequate volume of soil for analytical and archiving purposes. Subsamples will be combined to form a use area composite sample in accordance with procedures outlined in the CS OU-SOP-S-06 (*Test Pit Sampling*), or the site-specific SAP. Portions of each discrete subsample and composite sample shall be archived for possible future use.

SAMPLE ANALYSIS AND DATA VALIDATION

After collection and compositing, samples will be prepared and analyzed for constituents of concern using the methods described in the site-specific QAPP. Analytical results will be validated according to the most current EPA direction and/or as amended by the site-specific QAPP. The validated analytical results will be used to make decisions on remedial actions.

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-S-06
TEST PIT SAMPLING

A backhoe or excavator can be used effectively to sample soils from 0 to 25 feet or more below ground surface (bgs). In particularly rocky or hard soils a back hoe may be the most effective means of sampling shallow depths.

SHALLOW TEST PIT SAMPLING:

Shallow test pits are defined as those excavated pits that are less than 4 feet deep.

1. Locate the site as directed in the appropriate Quality Assurance Project Plan (QAPP).

2. Prior to site entry have a utility locate performed. Walk through the site and determine any site specific hazards associated with the sampling area. Discuss these with sampling crew and note in the field logbook. Double check the utility locates information by identifying where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. Determine if an underground sprinkling system is present. If sample locations have not been assigned in the QAPP, note the marked and/or probable locations of underground utilities and try to avoid those areas when choosing sample locations. Note the locations of overhead lines and overhead hazards and avoid those areas if possible.

3. If sample locations are identified in the QAPP use the appropriate survey method to locate. Stake test pit locations.

4. Most excavation companies have their own standard operating procedures (SOPs) for excavations, these machine specific SOPs and safety requirements should be consulted prior to site entry and the sampling protocols adjusted accordingly. Prior to beginning excavation, on-site safety protocol for excavation and sampling will be reviewed by the excavator operator and sampling crew.

5. The decontaminated backhoe will excavate the test pit to the desired depth. The excavated material should be layered adjacent to the test pit in the sequence in which it is removed. In particular topsoil should be separated from the underlying layers. Removed soil should be placed a minimum of 3 feet from the final edge of the test pit.

6. If the total depth of the test pit is less than four feet, the test pit should have one vertical smooth wall for sample collection and one sloping or stepped wall for entrance into the test pit. A competent person will examine the test pit and determine if the test pit is safe prior to entering.

7. Sample collection will take place in the test pit at intervals specified in the site-specific QAPP. Measure and mark the intervals to be sampled on the straight wall of the test pit.

8. The deepest marked sample interval should be scraped with a decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop to expose a clean surface.

9. Scrape the cleaned interval with the sampling tool and place the soil in a stainless steel bowl or a clean decontaminated disposable foil pan. Care must be taken to avoid material from above falling into the sample tool or sample bowl.

10. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining soil in the bowl with the sampling tool.

11. Transfer the soil sample directly into the appropriate sample container according to Community Soils Operable Unit (CS OU) SOP-SA-01 (*Soil Sample Packaging and Shipping*).

12. Record appropriate information about the sample collection on field data sheets and/or in the field logbook.

13. Decontaminate sampling tools according to procedures outlined in CS OU–SOP-DE-02 (*Equipment Decontamination*).

14. If sampling more than one interval in the test pit repeat the above procedure for each interval to be sampled. Always begin sampling with the deepest interval and collect samples working up to the interval closest to the surface.

15. Once sampling is complete the test pit should be filled in by the equipment operator, placing the soils in the test pit in the geologic sequence in which it was removed. Top soil should always be placed last and smoothed out to match the surrounding terrain as closely as possible.

16. The backhoe (or excavator) and other sampling equipment should undergo decontamination as outlined in CS OU-SOP-DE-02 (*Equipment Decontamination*).

DEEPER TEST PIT SAMPLING:

Test pits over 4 feet require a trench box for sampling or the sample material can be collected from removed soil piles placed by the equipment. If necessary samples can be collected from the equipment bucket once it has been placed on the ground and the equipment powered down.

1. Locate the site as directed in the appropriate QAPP .

2. Prior to site entry have a utility locate performed. Walk through the site and determine any site specific hazards associated with the sampling area. Discuss these with sampling crew and note in the field logbook. Double check the utility locates information by identifying where natural gas pipes enter any structures on the property or if yard lights or street lights are present with no overhead lines. Determine if an underground sprinkling system is present. If sample locations have not been assigned in the SAP, note the marked and/or probable locations of underground utilities and try to avoid those areas when choosing sample locations. Note the locations of overhead lines and overhead hazards and avoid those areas if possible. If sample locations are identified in the SAP use the appropriate survey method to locate.

3. If sample locations are identified in the QAPP use the appropriate survey method to locate. Stake the locations for the test pits.

4. Most excavation companies have their own SOPs for excavations, these machine specific SOP's and safety requirements should be consulted prior to site entry and the sampling protocols adjusted accordingly. Prior to beginning excavation, on-site safety protocol for excavation and sampling will be reviewed by the excavator operator and sampling crew.

5. The decontaminated backhoe will excavate the test pit to the desired depth. The excavated material should be layered adjacent to the test pit in the sequence in which it is removed. In particular topsoil should be separated from the underlying layers. Removed soil should be placed a minimum of 3 feet from the final edge of the test pit.

6. Sample collection will take place from the test pit at intervals specified in the site-specific Sampling and Analysis Plan.

7. If using a trench box the sampling protocol will be similar to that described in the Shallow Test Pit Sampling.

8. To sample using the backhoe or excavator as a sampling tool, a member of the sampling team needs to observe the excavation process and indicate to the equipment operator which buckets of soil should be placed aside for subsequent sampling. The decision on what soils to sample will be based on the SAP and may call for sampling protocol based on depths, color or lithologic changes.

9. Once test pit excavation is complete and the equipment has powered down the samples can be collected from the placed piles of soil. A decontaminated stainless steel trowel or scoop, a Teflon scoop, or a disposable plastic scoop should be used to clean the area of the pile to be sampled if it appears to have soil other than the designated interval on the surface. Care must be taken to get soils from the appropriate interval. If a large amount of sample is needed, such as for a proctor analysis, a clean shovel can be used to place soil directly into a sample container.

10. For smaller amounts place the soil in a stainless steel bowl or a clean decontaminated disposable foil pan. Soil from several different places in the pile can be collected for a more representative sample of the interval.

11. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the remaining material in the bowl with the sampling tool.

12. Transfer the soil sample directly into the appropriate sample container according to CS OU-SOP-SA-01 (*Soil Sample Packaging and Shipping)*.

13. Record appropriate information about the sample collection on field data sheets and/or in the field logbook.

14. Decontaminate sampling tools according to procedures outlined in CS OU–SOP-DE-02 (*Equipment Decontamination)*.

15. If sampling more than one soil pile from the test pit repeat the above procedure for each pile to be sampled.

16. Once sampling is complete the backhoe should fill in the test pit with the excavated material in the geologic sequence in which it was removed. The backfilled test pit should attempt to achieve a surface flush with surrounding terrain.

17. The backhoe and other sampling equipment should undergo decontamination as outlined in CS OU–SOP-DE-02 (*Equipment Decontamination)*.

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-D-01
ATTIC DUST SAMPLING WITH A MICRO-VACUUM

This SOP will discuss the procedures for attic dust sampling using the Gilian HFS 113A Micro-Vacuum (sampling pump). Micro-vacuum sampling is designed to collect dust using a collection nozzle attached to a filter holder (sampling cassette) that is connected to an air sampling pump. This SOP, in general, follows procedures outlined in ASTM D 7144-05A *Standard Practice for Collection of Surface Dust by Micro-vacuum Sampling for Subsequent Metals Determination.*

Prior to the sampling event:

1. Order the number of Micro-Vacuum sampling cassettes that will be required for the sample event. SKC, Omega Specialty Division, Micro-Vacuum Cassettes (SKC model number 225-9543) have been used successfully with the Gilian Micro-Vacuum. The sampling cassettes should be individually wrapped and sealed, and contain a 37 mm diameter MCE filter inside of a plastic case (cassette). The cassette should have 0.45 µm nozzle on one end and a means to connect tubing to the sampling pump on the other. Enough additional cassettes should be ordered so that duplicates and equipment blanks can be collected at the appropriate interval as described in the project specific SAP and/or QAPP and that there are replacements in case of a cassette malfunction or accidental contamination of a cassette.
2. The sample cassettes will be submitted to the analytical laboratory so that a pre-sample weight for each cassette can be determined. This pre-sample weight will be used to in calculating the mass of the collected dust for each sample. The weight of each sample cassette will be recorded by the laboratory and a unique laboratory identifier will be written on the original sample cassette storage bag so that the laboratory can readily access the information during analysis. The laboratory will place each sample cassette back in its original re-sealable plastic bag. Samplers will store the weighed sample cassettes in a plastic container to ensure that they are protected from moisture (moisture could alter the recorded pre-sample weight).
3. Charge the batteries on the sampling pumps. At least two pumps should be taken to each sample location in case there is a pump malfunction.
4. A flexible piece of silicone tubing should be attached to each sample pump. The silicon tubing to be used with the Gilian sampling pump has an inner diameter of 0.188 inches.
5. Contact residents and set up a time to sample. For attic sampling, the residents need to be present for at least the start of the sampling.
6. Assemble equipment as outlined on Attachment A.

Calibration of the Gilian Sampling Pump:

Equipment required for calibration includes: the Sampling Pumps, the Gilbrator Calibration Meter© (2 pieces), a sampling cassette that has been designated for calibration, small screw driver and the soap bubble solution provided by the manufacturer. The calibration cassette does not need to be weighed and can be used for multiple calibrations. It should be marked as the calibration cassette and not be used for sampling. Replace the cassette in its re-sealable plastic bag after each calibration.

1. Prior to calibration, the sampling pumps should be fully charged. Calibration will be done **daily** prior to any sampling activities. Each pump that will be used for sampling during the day requires calibration. A post calibration check will be completed for each pump at the end of each day.
2. Insert the calibration cassette in the end of the flexible hose attached to the sampling pump. To attach, remove the blue cap from the "wagon wheel" end of the calibration cassette and push the tubing onto the connector.
3. Assemble and lock in place the 2 pieces of the Gilbrator Calibration Meter©. Add an appropriate amount of soap solution to the Gilbrator following the manufacturer's directions. If possible leave the calibration meter set up for the end of day calibration check.
4. Connect the calibration cassette to the Gilbrator Calibration Meter© using a piece of flexible tubing. To connect the calibration cassette remove the red tip from the nozzle of the cassette and slide the nozzle inside the flexible tubing.
5. Using a pin, pen or small screwdriver turn on the sampling pump to begin calibration. The on-off switch is located on the front of the pump, left side near the bottom and is recessed.
6. Push the black button on the Gilbrator Calibration Meter© 10 to 15 times to lubricate the meter. Bubbles should rise all the way to the top of the tube, if the bubbles burst before reaching the top, more soap solution should be added. Continue pressing the button until bubbles flow smoothly out of the solution and up the tube.
7. Each sampling pump should be set to pump at 2.5 ± 0.1 Liters a minute (Lmin). To measure the pump flow rate, push the reset button on the Gilbrator Calibration Meter©. This will delete all previous flow measurements. Once the red light on the front of the meter goes out, push and hold the black button on the calibration meter until the red light goes out. If the reading on the calibration meter is not 2.5 ± 0.1 L/min the flow rate for the sampling pump will need to be adjusted. Make adjustments to the flow rate using a small screwdriver and turning the flow adjustment screw on the pump slightly. The screw is located to the right of the on-off switch and is recessed. Turning the screw to the left will lower the flow rate, turning the screw to the right will raise the flow rate. Once the initial adjustment has been made, push and hold the black button on the calibration

meter to determine the new flow rate. Continue adjusting the flow rate until it is very close to 2.5 L/min.

8. Once the flow rate on the pump has been set, begin taking readings with the Gilbrator Calibration Meter©. Press the reset button on the calibration meter to clear all previous flow readings. The red light will come on to show that it is deleting the information. Once the red light goes out, hold down the black button to release **ONE** bubble, the red light will again come on. When the red light comes on release the black button, this should release another bubble. Once the red light goes out again, press and hold down the black button until the red light goes on again. This provides 3 flow readings that the Gilbrator Calibration Meter© will average. If a fourth bubble is generated when the black button is released for the final time, delete the fourth reading by pushing the delete button on the calibration meter. Only 3 readings should be used for the average flow rate.
9. Push the button marked average on the Gilbrator Calibration Meter©. Record this reading as the "start" flow rate for each pump in the field logbook. This flow rate should be 2.5 ± 0.1 L/m. Each pump should be identified by their seriel number or other unique identifier. The "start" average flow rate for the pump used to collect a sample will also be recorded on the Attic Dust Sample Data Sheet. An example of the Attic Dust Data Sheet is included as Attachment B.

Post-Calibration or End of Day Calibration Check

1. Insert the connector on the calibration cassette into the flexible tubing attached to the sampling pump to be checked. To attach, remove the blue cap from the "wagon wheel" end of the calibration cassette and push the tubing onto the connector.
2. Assemble and lock in place the 2 pieces of the Gilbrator Calibration Meter©. Add an appropriate amount of soap solution following the manufacturer's directions.
3. Connect the calibration cassette to the Gilbrator Calibration Meter© with a piece of flexible tubing. To connect the calibration cassette, remove the red tip from the nozzle of the cassette and slide the nozzle into the flexible tubing.
4. Using a pin, pen or small screwdriver turn on the sampling pump.
5. Push the black button on the Gilbrator Calibration Meter© 10 to 15 times to lubricate the meter. This will release bubbles. Bubbles should go to the top of the tube, if the bubbles burst before reaching the top, add more soap solution. Continue pressing the button until bubbles flow smoothly out of the solution and up the tube.
6. Press the reset button on the calibration meter to clear all of the previous flow readings. A red light will come on to show that it is deleting the information. Once the red light turns off, hold down the black button to release **ONE** bubble, the red light will come on. Release the black button when the red light goes off, this should release another bubble. Once the red light goes out, press and hold down the black button until the red light goes on again. This should provide 3 flow readings that the Gilbrator Calibration Meter© will average. If a fourth bubble is generated when the black button is released for the final

time, delete the fourth reading by pushing the delete button on the calibration meter. Only 3 readings should be used to calculate the average for the end of day flow rate check.

7. Record the average flow rate for each pump as the "end" flow rate in the field logbook and on the Attic Dust Sample Data Sheet. Make sure that the "end "reading for each pump is paired with the appropriate "start" reading.
8. Calculate the average of the starting and stopping flow rate to confirm that it is within 2.5 ± 0.1 L/min. If it falls outside of that range make a note in the logbook as a deviation to the sampling protocol.

Attic Dust Sampling

Attic dust sampling must be done in with a crew of no less than 2 people. One team member will enter the attic and sample (sampler), the non-entrant will monitor the sampler for any health or safety issues, and provide support by running the stopwatch, handing up appropriate equipment and making sure that the resident stays an appropriate distance away from sampling activities.

Unless otherwise specified in the SAP, attic dust sampling will be conducted only in homes where the attic can be routinely accessed (by stairway, or ladder). If the attic access is nailed or painted shut, requires moving a lot of items (i.e. in a closet under shelving), or is located outside the residence and greater than 6 feet above ground surface the sampling will need to be reevaluated. If it is determined that the sampling is necessary, additional safety measures will need to be put in place.

If vermiculite or asbestos is present in the attic, sampling will not be conducted.

In most cases, attics will **not** be entered. Instead, sampling will be conducted in the area surrounding the attic access. This is not ideal because the area is prone to disturbance, resulting in less dust then other areas of the attic. However, uncertainty about the structural integrity of the attic (e.g., rafters, boards etc.) presents a high degree of risk and could cause potential damage to the home.

1. The day before the sampling event, contact the resident to confirm the appointment. Plug in the sampling pumps to charge.
2. After arriving at the property, take a photo of the front of the residence, note north direction.
3. Knock on the door and introduce yourselves to the resident(s). Upon entering the house, don disposable booties as to not track any dirt or liquids into the house. Explain what the sampling will entail and ask about the attic access. Determine if it is safe to access the attic and what equipment will be required.
4. One team member should complete any required residential questionnaires as detailed in the SAP. Take a photograph of the attic access prior to attempting entry. The location of the attic access and photograph information should be recorded in the logbook.

5. If a ladder is needed, 2 team members should carefully maneuver the ladder through the house to the attic access. A third person may be required to "spot" tight corners and low hanging doorways.
6. Lay a large sheet of plastic under the attic access. The plastic sheet should be big enough that there is a 2-3 foot buffer zone around the ladder or access stairs. Carefully set up the ladder on the plastic.
7. The sampler will don a Tyvek© suit, nitrile gloves and headlamp. The non-entrant will label the sampling canister with the appropriate sample identifier. The sample name, pump serial number or identifier, and sampler will be entered into the logbook and on the Attic Dust Sample Data Sheet. At this time, the sample pump should be turned on to warm up.
8. The sampler will pull down the attic stairs or climb the ladder (steadied by the non-entrant) and remove or open the access door. Be aware that objects may be resting on or adjacent to the access panel and may fall. If needed the non-entrant should place the access door in a location where it will not get soiled and out of the traffic area.
9. The sampler, without leaving the access point, will describe the attic features to the non-entrant who records the information in the logbook or on field data sheets. The sampler will remain on the stairs or ladder and will never fully enter the attic. Information of interest would include type of insulation, amount of insulation, the presence of ducts, and penetrations or openings from the roof to the attic.
10. Each sample of attic dust will consist of material collected from at least two different locations in the attic. Sampling locations adjacent to the access point should be identified by the sampler. Each sampling location needs to have an area of at least 100 cm^2. Wooden rafters, joists, planks or cardboard on the floor of the attic are ideal for sampling. Choose areas with heavy dust accumulation. If necessary, dust can be carefully collected from faced fiberglass batts. Once sample locations have been identified, pre-cut plexi-glass templates can be used to demarcate the area to be sampled. The templates can be placed directly on the sample surface and secured using tape. If templates will not work (sample area is to narrow or curved), a ruler or tape measure and masking tape can be used to mark an area of 100 cm^2. The non-entrant can hand up any equipment required.
11. The sampler should identify the location of the sample area (i.e west of access area, or north side of house). The non-entrant will write the sample number and location information on a 3" X 5" index card for each sample area. The cards and camera will be handed to the sampler and a photograph of each sample area should be taken. General attic conditions as well as any special features such as openings, insulation distribution, stored contents or the dust accumulation can also be photograph. Information on photographs should be recorded in the logbook by the non-entrant. Information for any SAP required questionnaires should be relayed by the sampler and recorded on the forms by the non-entrant.

12. The non-entrant will don new nitrile gloves, turn the pump off and attach the labeled sample canister to the pump. This can be done by removing the blue cap on the "wagon-wheel" end of the sampling canister and inserting it into the flexible tubing attached to the pump. The red cap on the nozzle end of the sample canister should also be removed. Place both end caps back in the re-sealable plastic bag back for temporary storage. Hand the pump up carefully to the sampler.
13. The sampler should turn the pump on when he is in position at the first sample location. As specified in ASTM D-7144-05a, collect the sample by holding the nozzle immediately adjacent to the surface to be sampled. The nozzle, which is cut at a 45° angle, should lightly touch the sample surface, but not be pressed hard against the area being sampled. The sampler should indicate to the non-entrant when sampling begins. The non-entrant will then record the start time to the minute and second in the logbook and on the Attic Dust Sample Data Sheet. Sampling at each location will be conducted for **one minute.** The non-entrant will be responsible for timing, and after one minute has passed will say "STOP". The sampler will then lift the nozzle from the surface and turn the pump off. During the collection period the sampler will sweep the collection nozzle from one side of the sampling area to the other. The rate of movement should be no more than 1 sec/10 cm. The sample area should be "swept" in the same direction until the entire sampling area has been "vacuumed" with the collection nozzle. After 30 seconds, repeat in a different direction 90° from the initial sampling direction. Make sure to cover the entire sampling area. Record the stop time in the logbook and on the Attic Dust Sample Data Sheet.
14. Move to the second sample area and repeat Step 13. Sample collection time should always be 1 minute for each 100 cm^2. Once sampling has been completed in the second area, the sample cassette should be examined to see if there is visible dust on the filter. If there is only a small amount of dust in the sample cassette, more locations should be sampled, continue sampling areas as described in Step 13. Once sampling is completed, record the total surface area per sample, i.e. if two 100 cm^2 areas were sampled the total area would be 200 cm^2, in the logbook and on the Attic Dust Sample Data Sheet.
15. If the sample nozzle becomes clogged, the sampler should tell the non-entrant to stop timing, hold the nozzle in an upright configuration and tap against a hard surface. Once the pump appears to be drawing air into the filter, the sampler should say "start" and the timing and sampling should resume.
16. If the filter in the sample cassette becomes overloaded as indicated by a >10% drop in the measured flow rate, additional cassettes will be needed to complete collection of the sample. The sampler will notify the non-entrant when timing should be stopped. The full sample cassette will be removed from the pump and handed to the non-entrant. The stored end caps will be placed on the cassette and the cassette will be placed in the original re-sealable plastic bag. A new sample cassette, labeled with the same information as the first sample cassette, except for the addition of 1of 2, 2 of 2 etc., will

be attached to the pump. The stop time for the first cassette and start time for the second cassette will be recorded in the logbook. Restart the stopwatch and continue timing until the sample location has been "vacuumed" for 1 minute.

17. Once sampling is complete, remove sampling cassette from the pump, replace both end caps and place in the original plastic re-sealable bag. Check that the sample number(s) are correct. Place all filters for 1 attic sample in a quart re-sealable plastic bag.
18. The non-entrant should review the collected information and make sure that there are no omissions. If it is determined that sampling is complete, the sampler can hand down equipment to the non-entrant and then exit the attic.
19. The sampler should stand on the plastic and carefully remove the Tyvek© coveralls and gloves, and immediately place them in a garbage bag. New gloves and booties should be donned and the sampler should climb the latter, steadied by the non-entrant, and restore the attic access cover to its original position.
20. The ladder should be lowered and carefully carried out by 2 people, if needed a 3rd person should be used as a spotter.
21. Carefully roll up the plastic that was under the ladder/access stairs and place in garbage bag. Use a handheld vacuum to touch up the area below the attic access.
22. Verify that field logbook entries and field data sheets are complete. Flaking paint in the sampled home or adjacent homes should be documented and photographed, if possible.
23. Thank resident.
24. Once outside, using wet-wipes or de-ionized water wetted paper towels, wipe off the pump, attached flexible tubing, ruler, templates, headlamp, handheld vacuum and the rails and feet of the ladder. Any other tools or equipment that may have come in contact with dust from the attic should also be wiped down.
25. The Tyvek© coveralls and plastic sheeting will be disposed of in accordance with SOP-DE-03 Investigation Derived Waste Handling.
26. Label the outer plastic re-sealable bag with the sample number and place in cooler for storage until the samples can be delivered to the laboratory for analysis. Ship in accordance with SOP-SA-01 Soil and Water Sample Packaging and Shipping.

ATTACHMENT A

ATTIC DUST SAMPLING
SUPPLY AND EQUIPMENT CHECKLIST

Attic Dust Sampling
Supply and Equipment Checklist

- ☐ **Sampling Equipment**
  - ☐ Gilian hi-flow sampler with associated silicon tubing
  - ☐ Gilbrator calibration meter
  - ☐ Pre-weighed, assembled filter cassettes with nozzles
  - ☐ Re-sealable plastic bags (quart and gallon)
  - ☐ Plastic sampling templates
  - ☐ Roll of 6-mil poly drop cloth
  - ☐ Garbage bags (32-gallon)
  - ☐ Digital timer

- ☐ **Tools**
  - ☐ Mini screwdriver set
  - ☐ Screwdriver set
  - ☐ Tape measure
  - ☐ Small rulers with centimeter scale
  - ☐ Blue or tan ½-inch masking tape\
  - ☐ Duct tape
  - ☐ Small pry bar
  - ☐ Flashlights
  - ☐ Ladders with cleanable steps (6-, 8-, and 10-feet)
  - ☐ Compass
  - ☐ Small, hand-held vacuum
  - ☐ Wet-wipes for hands and equipment
  - ☐ Paper towels

- ☐ **PPE**
  - ☐ Steel-toed boots
  - ☐ Safety glasses
  - ☐ Disposable tyvek® booties
  - ☐ Disposable tyvek® coveralls with hoods (no booties)
  - ☐ Knee pads
  - ☐ Headlamp with extra batteries
  - ☐ Powderless, latex-free or nitrile sampling gloves
  - ☐ First aid kit
  - ☐ Eye wash bottle
  - ☐ Drinking water (gallon bottles)

- ☐ **Office Supplies**
  - ☐ Digital camera with date/time stamp
  - ☐ Plastic tote
  - ☐ Notepads, field log books, and supply forms
  - ☐ Pens and dry markers
  - ☐ 3x5 Blank file cards or small whiteboard
  - ☐ Scissors

ATTACHMENT B

ATTIC DUST SAMPLING
SAMPLE DATA SHEET

ATTIC DUST SAMPLE DATA SHEET
Revised 09/20/12

Address								
Sampler			Date			Time		
Sample ID				Duplicate Collected? Y / N				
Pump Serial Number								
Pump Calibration, (L/min)	Date		Start		Stop		Average	
Sample Duration, min								
Comments:								
Location(s) Sampled:								
Location: Surface: Area Sampled (cm^2):		Location: Surface: Area Sampled (cm^2):			Location: Surface: Area Sampled (cm^2):		Location: Surface: Area Sampled (cm^2):	
Lab Sample #:								

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-SA-01
SOIL SAMPLE PACKAGING AND SHIPPING

1. In most cases, all sample containers collected from a specific sample location are placed in a large ziplock bag and shipped together. Samples will then be placed in a cooler which has been lined with a plastic bag. The samples will be surrounded with non-contaminating packaging materials to reduce movement and absorb any leakage. Ice will be double bagged and placed in the cooler. The plastic bag will then be sealed to contain the samples, packing material and ice.

2. The Field Team Leader or their designated representative will double check the chain-of-custody forms to assure those samples recorded on the chain-of-custody form are in the cooler. The Field Team Leader or the designated representative will then sign the chain-of-custody form to relinquish custody.

3. One copy of the signed chain-of-custody form will remain with the Field Team Leader. A photocopy may be made of the completed form if there are no carbon copies available. The paper work will then be placed in a sealed ziplock bag and taped to the inside of the cooler lid. If the shipping cooler contains more samples than can be analyzed in one analytical batch, the laboratory may request that the samples in the cooler be bagged for separate analytical batches. This may be necessary so that the appropriate Quality Control/Quality Assurance samples are included in each analytical batch. In this case separate chain-of-custody forms will be filled out for each batch and included in the appropriate bags. The chain-of-custody forms for each batch will be placed in a sealed ziplock bag and included at the top of the bag so that they are clearly visible to laboratory personnel when they open the bags.

4. The cooler will be labeled with the appropriate shipping labels (NOS, flammable liquids, flammable solids, this side up, fragile, etc.).

5. The cooler will then be closed and the appropriate shipping label (overnight shipping from Federal Express, UPS or the United States Postal Service or equivalent) will be affixed to the lid.

6. The Field Team Leader or the designated representative will sign COC seals and place the signed seals over the opening edge of the cooler.

7. Tape will then be placed over the custody seals and around the cooler.

8. The cooler(s) will then be transported to a secure storage, to the shipping agent, or directly to the laboratory.

Note: Bagging of samples and lining of coolers will not be necessary if samplers transport samples directly to the laboratory.

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-SA-03
FIELD QUALITY CONTROL SAMPLES

Field quality control (QC) is a part of the Project Quality Assurance/Quality Control (QA/QC) program and is described in detail in the site-specific Quality Assurance Project Plan (QAPP). This standard operating procedure (SOP) describes the preparation and collection frequency of field duplicate samples.

At least one set of field QC samples will be prepared for each sampling event. QA/QC samples will be collected at a frequency of 1:20. If the number of field QC samples taken is not equal to an integer multiple of the interval, then the next higher multiple will be used. For example, if a frequency of 1:20 is indicated and 28 samples are taken, then two QC samples will be prepared.

All field QC samples shall be shipped with field samples to the contract laboratory as per Community Soils Operable Unit Standard Operating Procedure (*Soil Sample Packaging and Shipping*) (CSOU-SOP-SA-01).

One field duplicate will be taken 1:20 and as follows:

> A field duplicate consists of two samples taken at the same location and time, but placed in different containers for separate analysis. Each duplicate shall be analyzed for identical chemical parameters.

1. Collect an adequate volume of sample to accommodate two sample containers.

2. Process the samples (as per SOPs) for each duplicate.

3. Label the two sample containers with appropriate sample numbers.

4. Record duplicate number, sample number, and sample location in the field log book.

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-SA-04
CHAIN OF CUSTODY FORMS FOR ENVIRONMENTAL SAMPLES

This standard operating procedure (SOP) establishes the requirements for documenting and maintaining environmental sample chain-of-custody from point of origin to receipt of sample at the analytical laboratory. This procedure shall apply to all types of air, soil, water, sediment, biological, and/or core samples collected in environmental investigations. It is applicable from the time of sample acquisition until custody of the sample is transferred to an analytical laboratory.

Chain-of-custody is an unbroken trail of accountability that ensures the physical security of samples, data and records. Custody refers to the physical responsibility for sample integrity, handling, and/or transportation. Custody responsibilities are effectively met if the samples are:

- In the responsible individual's physical possession;
- In the responsible individual's visual range after having taken possession;
- Secured by the responsible individual so that no tampering can occur; or
- Secured or locked by the responsible individual in an area in which access is restricted to authorized personnel only.

RESPONSIBILITIES

PROJECT MANAGER:

1. The Project Manager is responsible for overall management of environmental sampling activities, designating sampling responsibilities to qualified personnel, and reviewing any changes to the sampling plan.

FIELD TEAM LEADER:

1. The Project Manager may act as the Field Team Leader or may choose to appoint a Field Team Leader.

2. The Field Team Leader is responsible for general supervision of field sampling activities and ensuring proper storage/transportation of samples from the field to the analytical laboratory. Chain-of-Custody forms will be reviewed for accuracy and completeness to preserve sample integrity from collection to receipt by an analytical lab by the Field Team Leader. The review of chain-of-Custody forms may be delegated to qualified personnel. The Field Team Leader is responsible for sample custody until the sample has been properly relinquished as documented on the chain-of-custody form.

FIELD SAMPLER

1. The Field Sampler is responsible for sample acquisition in compliance with technical procedures, initiating the Chain-of-Custody, and checking sample integrity and documentation prior to transfer.

2. Field samplers are also responsible for initial transfer of samples consisting of physical transfer of samples directly to the internal laboratory or transferred to a shipping carrier, (i.e., United Parcel Service or Federal Express) for delivery.

LABORATORY TECHNICIAN

1. The receiving Laboratory Technician is responsible for inspection of transferred samples to ensure proper labeling and satisfactory sample condition.

2. Unacceptable samples will be identified and segregated. The Laboratory Project Manager will be notified.

3. The Laboratory Technician will review the Chain-of-Custody for completeness and file as part of the project's permanent record.

EQUIPMENT AND MATERIALS

- Seals and Labels;
- Chain of Custody forms and chain of custody seals (provided by contracted laboratory); and
- Packing and shipping materials as necessary.

1. All samples shall be collected and handled in accordance with the appropriate Community Soils Operable Unit Standard Operating Procedure (SOP) or methods described in the project Quality Assurance Project Plan or work plan. Samples will be transported in insulated coolers with ice ('blue ice' is acceptable) as necessary to maintain temperature at 4^{o} C+/- 2^{o}C until receipt by the analytical laboratory.

2. The Field Team Leader or designated Field Sampler shall initiate the Chain-of-Custody form for the initial transfer of samples.

3. A Chain-of-Custody form will be completed and accompany every sample. The form includes the following information:

- Project code;
- Project name;
- Samplers signature;
- Sample identification;
- Date sampled;

- Time sampled;
- Analysis requested;
- Remarks;
- Relinquishing signature, data, and time; and
- Receiving signature, date, and time.

4. The Field Sampler relinquishing custody and the responsible individual accepting custody shall sign, date, and note the time of transfer on the Chain-of-Custody form. (If the transporter is not an employee of sampling firm, the Field Sampler may identify the carrier and reference the bill of lading number in lieu of the transporter's signature.)

5. One copy of the Chain-of-Custody form shall be filed as a temporary record of sample transfer by the Field Sampler. The original form shall accompany the samples and shall be returned to the sampling firm as part of the contracted laboratory Quality Assurance/Quality Control (QA/QC) requirements. The original form will be filed as part of the project's permanent records.

6. The Project Manager (or designee) shall track the Chain-of-Custody to ensure timely receipt of samples by an analytical laboratory.

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-SA-05
PROJECT DOCUMENTATION

This Standard Operating Procedure (SOP) establishes the requirements for documenting and maintaining field logbooks and photographs. These procedures shall apply to all types of air, soil, water, sediment, biological, and/or core samples collected during Community Soils Operable Unit (CS OU) environmental investigations. These procedures apply from the time field work begins until site activities are completed.

RESPONSIBILITIES:

A designated field logbook will be used for each field project. If requested by the Project Manager a separate field logbook will be used for each field task within a larger project. Each logbook shall have a unique document control number. The logbooks will be bound and have consecutively numbered pages. The information recorded in these logbooks shall be written in ink. The author will initial and date entries at the end of each day. All corrections will consist of a single line-out deletion in ink, followed by the author's initial and the date. No bound field logbooks will be destroyed or thrown away even if they are illegible or contain inaccuracies that require a replacement document. These bound logbooks shall include the following entries:

1. A description of the field task.

2. Time and date fieldwork started.

3. Location and/or a description of the work areas, including sketches if needed, any maps or references needed to identify locations, and sketches of construction activities. If the location is an often visited field area changes in conditions from previous field events should be noted.

4. Names and company affiliations of field personnel.

5. Name, company affiliation or address, and phone number of any field contact or official visitors.

6. Meteorological conditions at the beginning of fieldwork and any ensuing changes in these conditions.

7. Details of the fieldwork performed and reference to field data sheets if used.

8. Deviation from the task-specific Sampling and Analysis Plan (SAP), Work Plan (WP) or SOP.

9. All field measurements made.

10. Any field laboratory analytical results.

11. Personnel and equipment decontamination procedures, if appropriate.

For any field sampling work the following entries should be made:

1. Sample location and number.

2. Sample type and amount collected.

3. Date and time of sample collection.

4. Type of sample preservation.

5. Split samples taken by other parties. Note the type of sample, sample location, time/date name of person, person's company, and any other pertinent information.

6. Sampling method, particularly any deviations from the SOP.

7. Documentation or reference of preparation procedures for reagents or supplies that will become an integral part of the sample if available. This information may not be available for water or soil sampling bottles that come preserved from the laboratory or for preservative provided by the laboratory. Bottle blanks will need to be used to evaluate the provided reagents.

8. The laboratory where the samples will be sent.

Photographs will be taken of field activities using a digital camera. Photographs should include a scale in the picture when practical. Telephoto or wide-angle shots will not be used, since they cannot be used in enforcement meetings. The following items shall be recorded in the bound field logbook for each photograph taken:

1. The photographer's name, the date, the time of the photograph, and the general direction faced.

2. A brief description of the subject and the fieldwork portrayed in the picture.

3. Sequential number of the photograph.

An electronic copy and/or a hard copy of the photographs shall be placed in task files in the field office after each day of field activities. Any supporting documentation from the bound field logbooks or field data sheets shall be photo copied and placed in the task files to accompany the photographs once the field activates are completed.

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-DE-01
PERSONNEL DECONTAMINATION PROCEDURES

The purpose of this Standard Operating Procedure (SOP) is to provide instructions for decontamination of personnel leaving a contaminated area. This practice has been prepared for Community Soils Operable Unit (CS OU) remedial action work. All members of the workforce who conduct the work shall be trained and competent in the risk-assessed work.

DECONTAMINATION INSTRUCTIONS

PROTECTION:

1. Follow personal protective measures outlined in the Site Specific Health and Safety Plan (SSHASP).

2. In the event that personnel decontamination becomes necessary, the outer more heavily contaminated items should be soap (nonphosphate)/tap water washed. Rinse the items in tap water.

3. Next, the inner, less contaminated items should be soap (nonphosphate)/tap water washed. Rinse the items in tap water.

4. Store the items separately so they are used in contaminated areas only.

5. For contaminants other than those found typically at uncontrolled hazardous waste sites, see the Health and Safety Manager.

EMERGENCY DECONTAMINATION:

1. If the decontamination procedure is essential to the life-saving process, decontamination must be performed immediately.

2. If heat related illness develops, protective clothing should be removed as soon as possible. **WASH, RINSE AND/OR CUT OFF PROTECTIVE CLOTHING/EQUIPMENT.**

3. If medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. Wrap the victim to reduce contamination of others.

4. Alert medical personnel to the emergency and instruct them about potential contamination. Instruct medical personnel about specific decontamination procedures.

5. Dispose of contaminated clothing and equipment properly.

HSSE CONSIDERATIONS

CHEMICAL HAZARDS:

HAZARDS	WHERE	HOW, WHEN, RESULT	CONTROLS
1. Contact with contaminants at hazardous waste sites.	Sites	Adverse health effects could result from ingesting inhaling and/or skin/eyes contact with contaminants.	Personnel will practice proper personal hygiene – wash hands prior to easting and when leaving the site. Work will be suspended during high wind conditions that may produce large amounts of visible dust. Employees will follow decontamination procedures as described above. Employees will wear nitrile/latex gloves when handling contaminated items.
2. Carbon Monoxide (CO).	Vehicle	Employees could be exposed to CO when traveling to and from job sites. Co from idling vehicles may cause irritated eyes, headache, nausea, weakness and dizziness.	Employees will minimize the time sitting in idling vehicles and will open window to increase ventilation.
3. Gasoline/diesel.	Vehicle	Exposure to gasoline/diesel could occur via inhalation and/or skin/eyes contact causing headache, dizziness, blurred vision and irritated skin.	Employees will fuel vehicles in a well-ventilated area and they will minimize splash hazards to prevent skin/eyes contact.

ELECTRICAL HAZARDS:

HAZARDS	WHERE	HOW, WHEN, RESULT	CONTROLS
1. Lightning	Outdoor sites	Electrocution, injury to death, or equipment damage could be caused by lightning.	Employees will follow the 30/30 rule during lightning storms.

MOTION HAZARDS:

HAZARDS	WHERE	HOW, WHEN, RESULT	CONTROLS
1. Struck by and/or caught in between heavy equipment.	Construction sites.	Personnel could be injured if struck by and/or caught in between heavy equipment.	Employees will communicate with the contractor's contact person to let him/her know Pioneer personnel are on site. Personnel will avoid working near heavy equipment, when possible. High visibility clothing will be worn.

GRAVITY HAZARDS:

HAZARDS	WHERE	HOW, WHEN, RESULT	CONTROLS
1. Falls from slips and trips	Uneven terrain, slick surfaces and steep slopes at testing sites.	Workers could get injured if they fall causing bruises, scrapes, or broken bones.	Workers will wear work boots with good traction and ankle support. Employees will plan their path and walk cautiously.

THERMAL HAZARDS:

HAZARDS	WHERE	HOW, WHEN, RESULT	CONTROLS
1. Cold/heat stress.	Sites – weather.	Exposure to cold climates may result in cols burns, frostbites, and hypothermia. Exposure to high	Training on signs and symptoms of cold/heat stress. Personnel will wear appropriate clothing

		temperatures may result in heat cramps, heat exhaustion, or heat stroke.	when working outdoors. Employees will remain hydrated and will have sufficient caloric intakes during the day.

RADIATION HAZARDS:

HAZARDS	WHERE	HOW, WHEN, RESULT	CONTROLS
1. Ultraviolet (UV) radiation.	Outdoors.	Employees could be exposed to UV radiation during summer months causing sun burns, skin damage and eye damage.	Employees will wear sunscreen, long-sleeve work shirts and long pants. Employees will also use safety glasses with tinted lenses.

BIOLOGICAL HAZARDS:

HAZARDS	WHERE	HOW, WHEN, RESULT	CONTROLS
1. Untrained worker.	Sites.	Adverse health effects or injury could result from lack of training.	Employees will take task training prior to performing decontamination procedures.
2. Hazardous plants and animals.	Testing sites.	Exposure to hazardous plants or animals may cause rashes, blisters, redness and swelling.	Training on the signs and symptoms of exposure to hazardous plants and animals. Avoid contact with hazardous plants and animals. First-aid kits will be available on site. Employees with allergies will notify their supervisor.

ADDITIONAL HSSE CONSIDERATIONS:

1. The required personnel protective equipment (PPE) during personnel decontamination is

level D PPE (hard hat, safety glasses, high-visibility work shirt or vest, long pants, and steel toes boots).

2. The applicable Material Safety Data Sheets (MSDSs) are for heavy metals, gasoline/diesel, and carbon monoxide.

3. Additional training for personnel decontamination is OSHA 4-hour HAZWOPER/8-hour refresher.

TOOLS REQUIRED:

1. The tools required for personnel decontamination procedures are work vehicle, soap, tap water, tarps, decontamination tubs, brushes, and sprayers.

COMMUNITY SOILS OPERABLE UNIT

STANDARD OPERATING PROCEDURE
CSOU-SOP-DE-02
EQUIPMENT DECONTAMINATION

All equipment leaving the contaminated area of a site must be decontaminated. Decontamination methods include removal of contaminants through physical, chemical or a combination of both methods. Decontamination procedures are to be performed in the same level of protection used in the contaminated area of a site. In some cases, decontamination personnel may be sufficiently protected by wearing one level lower protection. The information for site specific equipment decontamination and personnel protection levels as detailed in the sampling and analysis or work plan should be followed.

The following decontamination procedures are for typical uncontrolled hazardous waste sites, for a specific or unusual contaminant such as dioxins, see the site-specific Health and Safety Plan. Decontamination procedures should be used in conjunction with methods to prevent contamination of sampling and monitoring equipment. One time use equipment should be used if practical, and disposed of in accordance with the site-specific Health and Safety Plan

INORGANIC CONTAMINANTS - HEAVY METALS:

1. Remove gross contamination with a tap water rinse. If available, use pressurized or gravity flow tap water, if not a 5 gallon bucket of tap water and a stiff brush may be used.

2. Wash equipment in a solution of soap (no phosphate) and tap water with a stiff brush.

3. Triple rinse the equipment with tap water.

4. Triple rinse the equipment with de-ionized or distilled water.

5. If specified in the site Sampling or Work Plan, rinse the equipment with a mixture of 10:1 nitric acid in distilled water (10 parts water to 1 part nitric acid). In many cases, the tap water and de-ionized water rinses will be sufficient.

6. If a nitric rinse is used, rinse the equipment again with distilled water.

7. Place equipment on plastic sheeting or foil to air dry.

8. Wrap equipment in foil or plastic wrap to transport or store.

ORGANIC CONTAMINANTS:

1. Remove gross contamination physically with a disposable paper towel or if available with a tap water rinse using pressurized or gravity flow. If water is not available on site the equipment can be rinsed using a five gallon bucket of tap water and a stiff brush

2. Wash equipment in a solution of soap (no phosphate) and tap water with a stiff brush.

3. Triple rinse the equipment in tap water.

4. Triple rinse the equipment with de-ionized water.

5. Rinse the equipment with methanol (if appropriate, see site Sampling Plan or Work Plan to determine appropriate chemical rinses). If testing for dioxins, a hexane triple rinse will be included as part of the decontamination.

EQUIPMENT USED FOR DECONTAMINATION:

1. Triple rinse equipment (brushes, buckets, tubs) used in the decontamination process with water, preferably pressurized.

2. Agitate the equipment used in the decontamination process in the soap/tap water solution. (The tub which holds the solution will only have the water rinse.)

3. Triple rinse equipment with tap water.

4. Place equipment in appropriate areas, so they are used only for decontamination purposes (label if necessary).

DISPOSAL OF DECONTAMINATION SOLUTIONS:

1. Proper disposal of the soap/tap water solution, the tap water rinse, and the de-ionized water rinse is to a proper waste water container.

2. Proper disposal of the solvent rinse is to a proper organic solvent waste container.

3. When contaminants have been identified, either in the solutions or elsewhere on the site, solutions should be disposed of appropriately as discussed in the site specific Health and Safety plan. If they are hazardous (characteristic, listed, etc.) dispose of them as such.

4. WHEN USING OTHER THAN THE ABOVE MENTIONED SOLUTIONS, BE SURE TO CHECK WITH THE HEALTH AND SAFETY OFFICER AND THE PROJECT MANAGER. SOME SOLVENTS MUST BE EVAPORATED.

EFFECTIVENESS OF DECONTAMINATION:

1. Effectiveness of the decontamination procedures will be measured using field equipment rinsate blanks (see the site-specific Quality Assurance Project Plan).

ATTACHMENT A-2

SOIL LABORATORY
STANDARD OPERATING PROCEDURES

Attachment A-2

Soil Laboratory SOP

Index

Laboratory	SOP Number	SOP Title	# Pages
Pace	S-MT-ME-041-Rev 00	Soil Sieve	9
Pace	S-MN-I-367-Rev 15	The Determination of Percent Moisture in Soil and Solid Samples	13
Pace	S-MN-I-460-Rev 17	Preparation of Solid Samples and Wipes for Analysis by ICP and ICP-MS	9
Pace	S-MN-I-313-Rev 25	Inductively Coupled Plasma Atomic Emission Spectroscopy	19

Pace Analytical Services, Inc.
150 N. 9th Street
Billings, MT 59101

Phone: 406.254.7226
Fax: 406.254.1389

STANDARD OPERATING PROCEDURE

SOIL SIEVE

Reference Methods: NA

Local SOP Number:	S-MT-ME-041-Rev.00
Effective Date:	Date of Final Signature
Supersedes:	New Issue

APPROVALS

Billings Laboratory Operations Manager	26 Mar 2015 Date
Laboratory General Manager	06Apr2015 Date
Laboratory Quality Manager	30Mar2015 Date

PERIODIC REVIEW

SIGNATURES BELOW INDICATE NO CHANGES HAVE BEEN MADE SINCE PREVIOUS APPROVAL.

Signature	Title	Date
Signature	Title	Date
Signature	Title	Date

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TABLE OF CONTENTS

1. Purpose/Identification of Method

1.1. This standard operating procedure describes the process for drying and sieving soil samples to obtain a portion of soil for analysis

2. Summary of Method

2.1. The sample is split and a portion air dried. The air dried portion is then sieved through a selected sieve size. The portion that passes the sieve is then ready for analysis. Depending on client requirements, the original non-sieved portion and the portions larger than the selected sieve size may need to be archived.

3. Scope and Application

3.1. **Personnel:** This standard operating procedure is applicable to all analysts performing sieve analysis

3.2. **Parameters:** This standard operating procedure is applicable to soils or sediments.

4. Applicable Matrices

4.1. This SOP is applicable to soils and sediments.

5. Limits of Detection and Quantitation

5.1. Not applicable to this SOP.

6. Interferences

6.1. Not applicable to this SOP.

7. Sample Collection, Preservation, Shipment and Storage

7.1. The appropriate container for the analytical test requested should be used. For metals, samples are collected in 1 quart size plastic Ziploc bags. For organic parameters a 16 oz glass jar is used. Other sample containers sizes may be used with the goal of providing at least 2 cups of soil to sieve.

7.2. The appropriate preservation is determined by the analytical test requested. Mercury and organics samples are to be kept cooled, above freezing but below 6 C, from collection to placing the samples in the drying cabinets. Other metals may be stored at ambient temperature.

7.3. Samples are dried and sieved at room temperature. When thermal preservation is required the samples are then re-cooled after sieving to <6 C and shipped on ice to the analytical laboratory.

8. Definitions

8.1. Definitions are located in the Glossary section of the Quality Manual.

9. Equipment and Supplies (Including Computer Hardware and Software)

9.1. Equipment

Equipment	Vendor	Model / Version	Description / Comments
Ro-Tap sieve shaker	Various manufacture	--	--
Sieves	Gilson or equivalent	--	Stainless steel, #10, #60 or other sizes as needed
Sieve catch pans and lids	Gilson or equivalent	--	Stainless steel
Bakers racks	Restaurant Supply	--	To hold 18" x 26" trays
Drying Fans	Various manufacture	--	--
Mechanical Pulverizer	Retsch	RS100	--
Mortar and Pestle	--	--	Porcelain

9.2. Supplies

Supplies	Vendor	Model / Version	Description / Comments
Aluminum Trays	Restaurant Supply	--	~18” x 26” x 1”
Freezer Paper	Fisher Scientific or equivalent	50-200-5215	18” x 100’
Ziploc bags	--	--	Sandwich, quart, gallon sizes
Wooden Rolling Pin	Restaurant Supply	--	--
Rubber Mallet	--	--	--

10. Reagents and Standards

10.1. Not applicable to this SOP.

11. Calibration and Standardization

11.1. Not applicable to this SOP

12. Procedure

12.1. Place soils in the drying cabinet.

12.1.1. After samples are logged in they will be in a cooler or stored at ambient temperature depending on preservation requirements.

12.1.2. Pull a set of samples to be dried. Order the sample bags in numerical order. Make sure all the bags are present. Note: If standard reference material (SRM) samples were submitted by the client, those samples are not dried and sieved.

12.1.3. Line a tray with freezer paper wax side down. Fold the sides of freezer paper up about 2 inches on each side to form a “boat”. Two folded freezer paper sheets should fit on one large tray.

12.1.4. Write the sample number on the freezer paper. Place the entire sample on the freezer paper. Multiple trays may be used for drying if a large sample volume was received.

NOTE: If some of the original sample is to be retained (archived) return about 1/3 of the sample to its original container after homogenization.

12.1.5. Spread the soil evenly. Break up all clumps into about 1/2” or less size pieces. This will speed the drying process and ease the disaggregation process prior to sieving. Continue this process for all samples in the set. Change gloves between each sample.

12.1.6. Record the sample numbers in the Soil Sieve Logbook (Attachment I, or equivalent replacement). Record the sample number, the date and the time placed in the drying cabinet. Place the entire set in a drying cabinet to air dry overnight. Longer drying may be required for wetter samples.

12.2. Soil disaggregation procedure

12.2.1. After the samples are dried remove them from the drying cabinets. Record the date and time in the Soil Sieve Logbook. Trays may be stacked on top of each other but place freezer paper on top of the soil so that there is freezer paper between the soil and tray above it. The waxed side of the freezer paper should face away from the soil.

12.2.2. Place a tray on the counter. Carefully remove the freezer paper boat containing the dried sample onto another large tray. Pick any rocks, twigs or other foreign matter and set to the side of the freezer paper boat.

12.2.3. Disaggregate the soil. Disaggregation is the process of loosening the clumped soil. It is not meant to crush or reduce the natural particle size of the soil. Using a rolling pin, roll over the dried soil for 1-2 minutes. A rubber mallet may be used to disaggregate soil clumps. Take care that the sample remains on the freezer paper. Change gloves between samples.

12.3. Soil Sieving Procedure

12.3.1. Determine the sieve sized to be used to meet project specifications. Check with the project manager or lab manager. Generally soils are sieved using a #10 or #60 mesh sieve. Other sieve sizes may be used per project specifications. When sieve size is not specified by the client, default to #10.

12.3.2. Stack a set of sieves in the following order, bottom catch pan, #60 sieve, #10 sieve or catch pan and #10 sieve. Other sieve sizes may be used, stacking smallest on the bottom to largest on top. Pour the disaggregated soil onto #10 (or top) sieve. All contents are poured onto the sieve including the rocks and foreign matter that had been set to the side. Record the sample number on the side of the catch pan. An abbreviated number may be used such as 407-1. Use a sharpie marker to record.

12.3.3. Stack a second set of sieves, stacked catch pan, #60 sieve, #10 sieve. The stacked catch pan is a catch pan with a lipped underside so that it can be stacked on top of other sieves. Pour sample 2 onto the #10 sieve then stack this set of sieves on top of the other set of sieves. Record the sample number on the catch pan. Place a lid on the top #10 sieve.

12.3.4. Place these two sets of sieves on a RoTap. Tighten the RoTap adjustments so that the sieves fit tightly and securely in the RoTap. Set the timer for 10 minutes and begin the sieve shaking.

12.3.5. After10 minutes remove the sieves off the RoTap. Carefully separate the two sieve sets.

12.3.6. Label a glass jar or Ziploc bag with a printed sample label. Pour the contents in the catch pan into the labeled container. If a baggie is used, double bag to prevent spillage.

NOTE: Great care should be taken in matching the sample number written on the catch pans to the sample numbers on the labeled container.

12.3.7. Certain projects may require that the portion of sample above the sieve be retained. If this is required pour the sample remaining on top of the sieve(s) into a second container, label with the lab number and mark “Coarse Fragments”.

12.3.8. Record the sieve date, analyst, shaker ID and sieve size used on the Soil Sieve Logbook. Note yes or no if coarse fragments were retained.

12.4. Pulverization - Some projects or methods may require that the sieved sample be further pulverized prior to analysis. The sample may be pulverized with a motor and pestle or using the Retsch soil pulverizer. Instructions for the use of the Retsch pulverizer are attached (Attachment II)

12.5. Cleaning Sieves – the sieves must be washed and dried between each use.

12.5.1. Place the sieves in the sink and scrub with a brush or green scrubbie and running hot water to remove any soil particles embedded in the mesh. Rinse well with tap water then rinse with deionized water. Soap is not used as it is very difficult to rinse from the sieves.

12.5.2. Place the sieves and catch pans in an oven to dry. Alternatively allow to air dry overnight on the counter.

13. Quality Control

13.1. Not applicable to this SOP.

14. Data Analysis and Calculations

14.1. Not applicable to this SOP.

15. Data Assessment and Acceptance Criteria for Quality Control Measures

15.1. Not applicable to this SOP.

16. Corrective Actions for Out-of-Control Data

16.1. Not applicable to this SOP.

17. Contingencies for Handling Out-of-Control or Unacceptable Data

17.1. Not applicable to this SOP.

18. Method Performance

18.1. The analyst must read and understand this procedure with written documentation maintained in his/her training file which is located in the QA Office.

18.2. An initial demonstration of capability (IDC) must be performed per SOP S-All-Q-020, or equivalent replacement. A record of the IDC will be maintained in his/her file with written authorization from the Laboratory Manager and Quality Manager. Results are stored in the QA office.

19. Method Modifications

19.1. Not applicable to this SOP.

20. Instrument/Equipment Maintenance

20.1. All maintenance activities are listed daily in maintenance logs that are assigned to each separate instrument.

21. Troubleshooting

21.1. Not applicable to this SOP.

22. Safety

22.1. Chemicals or reagents are not used in this procedure.

22.2. Do not attempt to adjust the sieves in the “RoTap” while in use.

22.3. The “RoTap” sieve shaker should are placed in the drying room to reduce noise levels in the lab. Keep the drying room door closed during use to control noise levels.

23. Waste Management

23.1. Procedures for handling waste generated during this analysis are addressed in S-MT-S-001, Waste Handling and Management.

23.2. The Environmental Protection Agency (USEPA) requires that laboratory waste management practice be conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are characterized and disposed of in an acceptable manner. For further information on waste management consult SOP S-MT-S-001, or equivalent replacement.

24. Pollution Prevention

24.1. The company wide Chemical Hygiene and Safety Manual contains information on pollution prevention.

25. References

25.1. Pace Quality Assurance Manual - most current version.

25.2. National Environmental Laboratory Accreditation Conference (NELAC), Chapter 5, “Quality Systems” - most current version.

25.3. The NELAC Institute (TNI); Volume 1, Module 2, “Quality Systems” - most current version

26. Tables, Diagrams, Flowcharts, and Validation Data

26.1. Attachment I – Soil Sieve Logbook, F-MT-ME-245 (or equivalent replacement)

26.2. Attachment II – RS100 Pulverizer Operating Instructions F-MT-I-192

27. Revisions

Document Number	Reason for Change	Date
S-MT-ME-041-Rev.00	First Issue	24Mar2015

ATTACHMENT I – Soil Sieve Logbook

Pace Analytical	Document Name: **Soil Sieve Logbook**	Document Revised: 25March15 Page 1 of 50
	Document No.: **S-MT-ME-245 Rev.00**	Issuing Authority: Pace Montana Quality Office

	Drying		Sieving				
Sample	**Date/ Time In**	**Date/ Time Out**	**Date**	**Shaker ID**	**Sieve Size**	**Coarse Frag Retained?**	**Pulverized?**
	Date In	Date Out	Date Sieved				
	________	________	________				
	Time In	Time Out	Sieve Time				
	________	________	10 Minutes				
	Analyst		Analyst				
	________		________				

Shaker IDs: 1-11MT47 2-11MT48 3-11MT49 4-11MT50

Signed By/ Date:________________________

ATTACHMENT II – RS100 Pulverizer Operating Instructions

Pace Analytical	**Document Name:** **RS100 Pulverizer Operating Instructions**	**Document Revised: 15Mar2012** **Page 1 of 1**
	Document No.: **F-MT-I-192-Rev.00**	**Issuing Authority:** **Pace Montana Quality Office**

PACE MT RS100 PULVERIZER OPERATING INSTRUCTIONS

STATEMENT OF PURPOSE

To aid analysts with the operation of the RS100 Pulverizer.

TO OPEN PULVERIZER

Power on
Key unlocked
Push circle  until green and red lights come on
Lift lid

TO OPERATE

Remove lid from grinding set
Leaving grinding tools in place, add sample
Brush excess sample off top of grinding tools
Replace lid
Place set on vibrating plate and clamp securely
Close lid, red light should turn off
Using + or - keys, set time in seconds (20-25 is usually sufficient)
Set speed (usually 1400)
Press blue S to start
Open lid when red light comes on
If washing between samples, you *must* dry the grinding set- otherwise it will rust

Pace Analytical Services, Inc.
1700 Elm Street SE, Suite 200
Minneapolis, MN 55414

Phone: 612-607-1700
Fax: 612-607-6444

Pace Analytical™
www.pacelabs.com

STANDARD OPERATING PROCEDURE

THE DETERMINATION OF PERCENT MOISTURE IN SOIL AND SOLID SAMPLES

Reference Methods: ASTM D 2974-07

Local SOP Number:	S-MN-I-367-Rev.15
Effective Date:	Date of Final Signature
Supersedes:	S-MN-I-367-Rev.14

APPROVALS

John T Rue
Laboratory Assistant General Manager

7/31/2014
Date

Melanie Ollila
Laboratory Quality Manager

31 Jul 2014
Date

PERIODIC REVIEW

SIGNATURES BELOW INDICATE NO CHANGES HAVE BEEN MADE SINCE PREVIOUS APPROVAL.

Signature	Title	Date
Signature	Title	Date
Signature	Title	Date

This is **COPY#** 12 Distributed on **10Feb2015** by SDP and is ____ **CONTROLLED or** X **UNCONTROLLED**

TABLE OF CONTENTS

1. PURPOSE/IDENTIFICATION OF METHOD

1.1. This standard operating procedure describes the gravimetric determination of the percent moisture by measuring the solids content of soils, peats, organic clays, silts, etc.

2. SUMMARY OF METHOD

2.1. A representative portion of a soil sample is dried in an oven and the solids content is determined by the weight loss. The percent moisture content is calculated from the solids content.

3. SCOPE AND APPLICATION

3.1. **Personnel**: The policies and procedures contained in this SOP are applicable to all personnel involved in the analytical method or non-analytical process.

3.2. **Parameters**: This SOP is applicable to most moisture bearing solids and has the minimum detectable quantity of 0.1%.

4. APPLICABLE MATRICES

4.1. This SOP is applicable to most moisture bearing solids.

5. LIMITS OF DETECTION AND QUANTITATION

5.1. Not applicable to this SOP.

6. INTERFERENCES

6.1. Not applicable to this SOP.

7. SAMPLE COLLECTION, PRESERVATION, SHIPMENT AND STORAGE

7.1. Table 7.1 Sample Collection, Preservation and Storage.

Sample type	Collection per sample	Preservation	Storage	Hold time
Soil/Solid	Collect samples in an unpreserved sample container. Store above freezing but below 6°C until analysis	n/a	Store above freezing but below 6°C until analysis	There is no specified holding time in ASTM 2974. The LIMS is set to 30 days from collection for the sake of an acode requirement, but data will not be qualified for holding time exceedances

8. DEFINITIONS

8.1. Definitions of terms found in this SOP are described in the Pace Analytical Services Quality Manual, Glossary Section.

8.2. Dry Weight – The weight of a sample based on percent solids after drying in an oven at a 105°C ±5°C.

8.3. Sample Delivery Group (SDG) – A unit within a single project that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a project, received over a period of up to 14 calendar days. Data from all samples in an SDG are reported concurrently. A Sample Delivery Group is generally defined by one of the following, whichever occurs first:

8.3.1. All Samples within a project; or

8.3.2. Every set of 20 field samples within a project; or

8.3.3. All samples received within a 14-day calendar period.

8.3.4. Samples may be assigned to Sample Delivery Groups by matrix (i.e., all soil samples in one SDG, all water samples in another), at the discretion of the laboratory. Clients may establish different SDG classifications to meet project specific requirements.

9. EQUIPMENT AND SUPPLIES (INCLUDING COMPUTER HARDWARE AND SOFTWARE)

9.1. Table 9.1 - Equipment and Supplies

Supply	Description	Vendor/ Item # / Description
Weighing dish	Disposable aluminum foil	Fisher Scientific #08-732-101, or equivalent
Aluminum foil	Novelis Foil, or equivalent	Fisher Scientific 1217, or equivalent
Metal Spatula or Knife	Metal spatula, knife or spoon	N/A
Oven	Gravity Convection Oven	Baxter DS-64, or equivalent
Balance	Analytical with a minimum sensitivity of 0.01 g	SN H47315, or equivalent
Desiccator	With drierite in a metal tray	Fisher Scientific, or equivalent
Pace Workbench	Sample Preparation Logbook and Data Transmission Software	see master list for most current version
Horizon	Data Reporting Software	see master list for most current version

10. REAGENTS AND STANDARDS

10.1. Table 10.1 - Reagent and Standards

Reagent/Standard	Concentration/ Description	Requirements/ Vendor/ Item #
Drierite	Drierite will change from blue to pink when ineffective	Fisher Scientific. P/N 23005
Anhydrous calcium Sulfate	Color indicating	Fisher Scientific P/N 13005

11. CALIBRATION AND STANDARDIZATION

11.1. Initial Calibration

11.1.1. All balances and weights are calibrated by an outside agency on an annual basis.

11.2. Daily Calibration

11.2.1. Daily calibration of the balance using one high, one medium, and one low Class I Standard weight.

11.2.2. Each day calibrate the balance that will be used for the moisture analysis with **50.0 g**, **10.0 g** and **1.0 g** weights that are traceable to the National Institute of Standards. Record the appropriate information in a calibration logbook.

11.2.3. Record oven temperature daily in the appropriate logbook.

11.2.4. Note in comments section of logbook if the Drierite is to be replaced. This is determined by color. If pink, Drierite it no longer anhydrous and must be replaced with anhydrous blue-colored Drierite. See S-MN-O-557, Drierite Regeneration (or equivalent replacement), for procedure.

11.3. Calibrate thermometer in oven on an annual basis. Document calibration using Thermometer Calibration Benchsheet F-MN-L-281 (or equivalent replacement)..

11.4. Read the temperature of the oven on a daily basis. Document in the Oven Temperature logbook.

12. PROCEDURE

12.1. Building the Batch

12.1.1. The maximum batch size allowed is 20 samples. One duplicate should be performed for every 10 samples analyzed.

12.1.2. Double click on EPIC PRO icon and enter your username and password.

12.1.3. Left click on ‘batching’, left click on ‘new batch’.

12.1.4. Type in ‘MPRP” as the Queue and click ok.

12.1.5. Double click on the row for Dry Weight.

12.1.6. Click on build batch.

12.1.7. The first sample in the batch is automatically assigned a duplicate. Confirm that there is enough sample to run a duplicate (at least 12g). If the sample selected does not have enough volume available, highlight the DUP and click on the **X** box in the tool bar to remove it. Choose another sample and add a duplicate using the steps below. If there are more than 10 samples in the batch, select one of the samples and then click ‘Add QC’ and select ‘Dup’ and click ‘Add QC’.

12.1.8. Delete the blank from the batch.

12.1.9. A sample highlighted in RED indicates that the sample is a RUSH.

12.1.10. Press save and print your batch worklist.

12.1.11. Obtain samples from the cooler and organize by batch onto trays.

12.1.11.1. Determine whether or not a specific container was collected for dry weight (normally a 20mL glass vial).

12.1.11.2. If not, a metals container should be utilized for dry weight if possible.

12.1.11.3. Moisture samples cannot be obtained from WIDRO, GRO or VOC sample container.

12.1.12. Dry weights are automatically assigned to samples having a solid matrix. Certain samples are not required to have dry weights. If these samples are logged in to the moisture queue, see a project manager to get the test removed.

12.1.12.1. TCLP

12.1.12.2. 8280 low res dioxin

12.1.12.3. VOC/GRO trip blanks

12.1.12.4. pH

12.1.12.5. Paint Filter

12.1.12.6. Flashpoint

12.2. Build the prep log template.

12.2.1. Launch the balance utility application (BalUtil) from the desktop before logging into the Workbench (the balance utility must be running in order for the balance to connect to the electronic prep log).

12.2.2. Log into the Workbench using your Epic Pro username and password (you must use the Firefox internet browser).

12.2.3. Single click on the Pace Electronic Log Icon (a new window will open).

12.2.4. Load a new ‘ASTM D2974 | Percent Moisture / Percent Total Solids’ template (F-MN-I-348, or equivalent replacement) in the workbench.

12.2.4.1. Click on tri-colored puzzle piece icon to the right of the “No Template Loaded” field.

12.2.4.2. Click drop down arrow for “search criteria”.

12.2.4.3. In the “Qc Rule” field, type in *moisture* and hit search in order to locate the Dry Weight prep log.

12.2.4.4. Click on the Template that populated in the Search Results window.

In the far right pane, under Search by Batch, type in the HBN # for the dry weight batch you created in Epic Pro, click on the magnifying glass icon to display the samples in the HBN.

12.2.4.5. From the list of samples that populates, select all the samples you want to add to the prep log. Click and drag the samples into the sample area of the prep log.

12.2.4.6. Observe the sample position number that the prep log associates with each EPIC PRIO sample number. Use a black marker to write the EPIC Pro batch number on the first tray (empty tray).

12.2.4.7. Order the trays in the exact numerical order that is displayed on the prep log template. The tare masses MUST be obtained in this order.

12.3. Obtain Wet Weight

12.3.1. Click on the Balance icon to the left of the AutoPost button on the tool bar to connect to the balance.

12.3.2. Double click under “Dish Weight”, in the bottom, middle pane, for the first sample.

12.3.2.1. Place a tin on the balance, wait for the balance to stabilize and press the red button next to the balance to send the weight to prep log. You should now see the tare mass displayed in the “Dish Weight” field for your sample. Tare all of the subsequent trays in this manner.

12.3.3. Enter the number ‘1’, to correspond to your numbered tray, under the ID field that corresponds to the first sample in your batch. Click in the Dish weight field for the first sample to autopopulate the tray numbers for the remaining samples in the batch. Order the trays in the **exact** numerical order that is displayed on the prep log template. <u>**The wet masses MUST be obtained in this order**</u>.

12.3.4. Place the tray on the balance. The same tare mass that is recorded on the prep log template should be displayed on the balance. Confirm the lab ID with the one in the template.

12.3.5. Obtain a representative sample by stirring. Make a comment in the ‘Sample Notes’ field if a sample or its DUP is not homogenous. Do not remove any rocks that are smaller that pea size. Add 5.0-10.0g of sample to the tray.

12.3.6. Place tray on the balance and close both balance doors. Double click in the “Wet Weight w/Dish” field for the first sample. Press the red button that is located next to the balance. You should now see the wet mass that is displayed on the balance also displayed in the correct cell of the prep log template. Obtain the wet mass for all of the subsequent samples in this manner.

12.3.7. Click the Disk icon at the top of the prep log to save your work.

12.3.7.1. In the Batch Group pop up window save the prep log using the naming scheme: Batch# HBN# DW

12.4. Dry Samples

12.4.1. Place samples in the oven. Dry the sample overnight (minimum of 16 hours).

12.4.1.1. In the top Batch pane of the prep log template, double click in field under “Oven Temp In1” and enter the observed temperature of the oven in degrees Celsius. (Do not enter the corrected temperature; the prep log performs this calculation).

12.4.1.2. The correction factor of the thermometer ID associated with the oven will calculate and display the corrected temperature based on the observed temperature you recorded. The date, time that samples were placed in the oven, as well as the analyst initials, will populate once the observed temperature is entered.

12.4.2. Click the Disk icon at the top of the prep log to save your work.

12.4.3. If a sample was dried for less than 16 hours, it must be documented that constant weight was attained. To do this, record data for a minimum of two weigh/dry/desiccate weigh cycles with a minimum of 1 hour drying time in each cycle. Constant weight is defined as a loss in weight of <0.01 g between the start weight and final weight of the last cycle.

12.4.4. Samples should not be dried longer than 24hours. Remove the sample from the oven, record the date and time the samples were removed from the oven by entering the observed oven temperature in the top, Batch pane under “Oven Temp Out1”. You should see the corrected temperature, date, time, and your initials populate in this field.

12.4.5. Please samples in a desiccator. In the top, Batch pane, double click the field under “Desic. In1” and enter the Instrument ID for the desiccator. You should see the date, time and your initials populate in this field. Allow samples to cool in the desiccator for at least 30 minutes.

12.4.6. Click the Disk icon at the top of the prep log to save your work.

12.5. Obtain Dry Weights

12.5.1. Open the Workbench and find your prep log template.

12.5.1.1. Click on the Magnifying Glass icon.

12.5.1.2. Click drop down arrow for “search criteria”.

12.5.1.3. Search for the batch you plan to work with by Analyst Initials, HBN#, Batch#, or Batch Group Name.

12.5.1.4. Double click on the batch to reopen the prep log template.

12.5.2. In the top, Batch pane, double click the field under “Desic. Out1” and enter the desiccator ID to document the date/time/initials you removed the samples from the desiccator.

12.5.3. Click the Balance icon to the left of the AutoPost button to connect the balance to the prep log.

12.5.4. Order the trays in the **exact** numerical order that is displayed on the prep log template . **<u>The dry masses MUST be obtained in this order</u>**.

12.5.5. In the bottom, middle, Sample pane, double click in the field under Dry Weight 1 for the first sample.

12.5.6. Tare the balance, place sample tray on the balance. Close balance doors.

12.5.7. Press the red button that is located next to the balance. You should now see the dry mass that is displayed on the balance also displayed in the correct cell of the prep log template.

12.5.8. Obtain the dry mass for all of the remaining samples in this manner.

12.5.9. The TS Posted (%) and the Percent Moisture data will autopopulate based on the dry weight entered.

12.5.10. Calculate percent solids by the formula below. This calculation will be performed and reported in EPIC via the Workbench. This value will be used for calculating analytical concentration on a dry weight basis

$$\%\ \text{Solids} = \frac{\text{Sample Dry Weight}}{\text{Sample Wet Weight}} \times 100$$

12.5.11. Add any batch notes or sample notes to the prep log as necessary. The Batch Notes field in the top pane can be used to document items that affect the whole batch. The Sample Notes field in the bottom, middle pane can be used to document items that are specific to that sample. Remember that all of these fields can be viewed by clients via a data package; take care to ensure spelling and grammar are correct and that no client/proprietary information is revealed.

12.5.12. Click the Disk Icon to save your work.

12.5.13. The RPD of the duplicate sample for each run must be evaluated using either the electronic Logbook or the Validation Report generated from the LIMS.

12.5.14. Validation Report

12.5.14.1. In LIMS under the Systems menu, select Submit Jobs,

12.5.14.2. Select Validation Report from the Jobs menu.

12.5.14.3. Enter the Queue (MPRP) and the HBN number.

12.5.14.4. Click OK and review the Validation Report on screen via PDF.

12.5.15. RPD calculation in the electronic Logbook

12.5.15.1. Once you dry weight data is entered, save the logbook template.

12.5.15.2. Click on the Menu button.

12.5.15.3. Select (DEBUG) Show QC from the menu

12.5.15.4. Review the RPR for the duplicate sample(s).

12.5.16. If the %RPD exceeds 30% for the duplicate sample, the batch must be re-prepped and re-analyzed.

12.6. Auto Posting to Epic

12.6.1. Review your data entries and verify all of the information in the prep log is correct for your batch, click on “AutoPost” to send your data to Epic Pro (once you autopost data you cannot make any changes to the prep log. See your supervisor in the event that any edits are needed after autoposting.).

12.6.2. Give the Batch Worklist you printed in step 12.1.10. to your supervisor for data validation according to SOP S-MN-L-132 (or equivalent replacement).

12.7. Review and validate data.

12.7.1. The data will be available in EPIC PRO in about 20 minutes.

12.7.2. Click on the **EPIC PRO** icon.

12.7.3. Login using your username and password.

12.7.4. Click Batching, Edit, By Batch, enter the Queue and Batch number and press F10.

12.7.5. Review the CC column for all samples in the batch, all entries should be “OK” and the A column should have a (*).

12.7.6. Click ‘systems’, then click ‘Submit Jobs’

12.7.7. Select validation report. Enter the Queue and Batch number and press F10.

12.7.8. View the validation report on-screen.

12.7.9. Click on Batching, Data Review.

12.7.10. Verify Percent Moi column against the information on the validation report.

12.7.11. Double click the status box, click OK, save.

12.7.12. Log into the Work Bench (Electronic Prep Log).

12.7.13. Click on the Magnifying Glass icon and search for the batch you want to review.

12.7.14. After you have reviewed the data, click “Review”. You should see the date, time and analyst initials appear in the Reviewed By field, documenting when you performed the review.

12.7.15. Click the Disk icon to save your work.

13. QUALITY CONTROL

13.1. QC Criteria Table 13.1

QC Sample	Components	Frequency	Acceptance Criteria	Corrective Action
Duplicate	Client provided sample	One sample must be prepared and analyzed in duplicate at a frequency of 1 in 10 samples or 1 per analytical batch, whichever is more frequent.	The RPD should be ≤ 30%.	If the dup fails the samples associated with that dup are put into re-run status and they are re-analyzed.

13.2. Assure Drierite is anhydrous. When color-indicating Drierite turns from blue to pink, it must be changed and is no longer anhydrous. Fill metal tray with fresh Drierite (non-indicating), and top with a sufficient amount of blue, color-indicating Drierite. See section 11.2.4 and procedure S-MN-O-557, Drierite Regeneration (or equivalent replacement) for more information.

14. DATA ANALYSIS AND CALCULATIONS

14.1. Calculate the RPD (relative percent difference) of the duplicates for each run as follows:

$$\%RPD = \frac{|S - D|}{(S + D) / 2} \times 100$$

Where:

S = Sample result, (%w/w)
D = Duplicate result, (%w/w)

15. DATA ASSESSMENT AND ACCEPTANCE CRITERIA FOR QUALITY CONTROL MEASURES

15.1. Not applicable to this SOP.

16. CORRECTIVE ACTIONS FOR OUT-OF-CONTROL DATA

16.1. Not applicable to this SOP.

17. CONTINGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

17.1. Not applicable to this SOP.

18. METHOD PERFORMANCE

18.1. All applicable personnel must read and understand this SOP with documentation of SOP review maintained in their training files.

18.2. **Demonstration of Capability (DOC)**: Every analyst who performs this method must first document acceptable accuracy and precision by passing a demonstration of capability study (DOC) per S-ALL-Q-020, Training Procedures, or equivalent replacement.

19. METHOD MODIFICATIONS

19.1. Not applicable to this SOP.

20. INSTRUMENT/EQUIPMENT MAINTENANCE

20.1. Not applicable to this SOP.

21. TROUBLESHOOTING

21.1. Not applicable to this SOP.

22. SAFETY

22.1. **Standards and Reagents**: The toxicity and carcinogenicity of standards and reagents used in this method have not been fully defined. Each chemical compound should be treated as a potential health hazard. Reduce exposure by the use of gloves, lab coats and safety glasses. Material Safety Data Sheets (MSDSs) are on file in the laboratory and available to all personnel. Standard solutions should be prepared in a hood whenever possible.

22.2. **Samples**: Take precautions when handling samples. Samples should always be treated as potentially hazardous “unknowns”. The use of personal protective equipment (gloves, lab coats and safety glasses) is required when handling samples. In the event a sample container must be opened, it is recommended to perform this in a hood whenever possible.

23. WASTE MANAGEMENT

23.1. Procedures for handling waste generated during this analysis are addressed in S-MN-S-003, Waste Handling, or equivalent replacement.

23.2. In order to minimize the amount of waste generated during this procedure, analyst should prepare reagents in an amount which may be used in a reasonable amount of time (e.g., before a reagent expires).

24. POLLUTION PREVENTION

24.1. The company wide Chemical Hygiene and Safety Manual contains information on pollution prevention.

25. REFERENCES

25.1. Pace Quality Assurance Manual- most current version.

25.2. National Environmental Laboratory Accreditation Conference (NELAC), Chapter 5, “Quality Systems”- most current version.

25.3. The NELAC Institute (TNI); Volume 1, Module 2, “Quality Systems”- most current version.

25.4. EPA Contract Laboratory Program SOW for Inorganic Analysis Document ILM 05.4. December 1, 2006.

25.5. ASTM D 2974-07, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.

26. TABLES, DIAGRAMS, FLOWCHARTS, AND VALIDATION DATA

26.1. Attachment I - Dry Weight Prep Log Instructions

27. REVISIONS

SOP Number	Revisions	Date
S-MN-I-367-Rev.14	Removed DoD reference from section 25 Removed Tongue depressors and add metal or knife in 9.1	05March 2014
S-MN-I-367-Rev.15	Updated SOP to include new procedure using the Pace Workbench, electronic prep log that replaced LimsLink. 9.1-Replaced Limslink with Pace Workbench in equipment list 11.3-Changed calibration documentation—F-MN-L-281 Benchsheet replaces the logbook 12.1.7 – changed to 12g 12.1.11.3 – changed to WIDRO 12.1.12.3 – 12.1.12.6 – added 12.3.3 – added procedure for dish weight entry 12.5.4 – removed "LimsLink worksheet" and added "prep log template" 12.5.10 – revised calculation 12.5.13-12.5.16 - added 12.2-Added a section to procedure explaining the process of building the prep log template; procedure pertaining to Limslink was deleted 12.3-modified 12.2 and created a separate section for the procedure for obtaining wet weight 12.4-created a sub-section for procedure in dealing with Dry Samples 12.5-modified procedure to apply to Obtaining Dry weights with Pace Workbench 12.6-Updated section to correctly explain Autoposting to Epic using Pace Workbench 12.7—updated Review and Data validation section to apply to Pace Workbench method 26.1—Added Attachment I (Dry weight instructions)	03Jul2014

Attachment I – Dry Weight Prep Log Instruction

Pace Analytical®	Document Name: Dry Weight Prep Log Instructions	Document Revised: 02Apr2014 Page 1 of 2
	Document No.: F-MN-C-141-rev.00	Issuing Authority: Pace Minnesota Quality Office

Logging into the Prep Log:

1. Launch the Balance Utility (BalUtil) from the desktop.
2. Open Pace WorkBench Desktop using FireFox.
3. Preplog username/password is the same as your Epic Pro login.
4. Single Click on *Pace Electronic Log* Icon (a new window will open).

Starting a new Prep Log for your batch:

1. Click on tri-colored puzzle piece icon to the right of the "No Template Loaded" field.
2. Click drop down arrow for "search criteria".
3. In the "Qc Rule" field, type in *moisture* and hit search in order to locate the Dry Weight prep log.
4. Click on the Template that populated in the Search Results window.
5. In the far right pane, under Search by Batch, type in the HBN # for the dry weight batch you created in Epic Pro, click on the magnifying glass icon to display the samples in the HBN.
6. From the list of samples that populates, select all the samples you want to add to the prep log.
   a. You can add the samples individually if you want to pull them into the log in a specific order by clicking on the sample and dragging it into the middle, bottom Sample pane of the prep log.
   b. You can add all the samples at once (samples will populate in the same order they appear in the Search pane) by clicking the first sample #, holding the shift key and clicking the last sample # and dragging the sample set into the middle, bottom Sample pane of the prep log.
7. Click on the Balance icon to the left of the AutoPost button on the tool bar to connect to the balance.
8. Double click under "Dish Weight", in the bottom, middle pane, for the first sample.
   a. Place a tin on the balance and press the red Balance Button to send the weight to prep log.
   b. Repeat for all tins used for all samples in batch.
9. Double click under "Wet Weight/w Dish" for the first sample.
   a. Place a tin on the balance, add sample, and press the red Balance Button to send the weight to prep log.
   b. Repeat for all samples in batch.
10. In the top Batch pane of the prep log, double click in field under "Oven Temp In1" and enter the observed temperature of the oven in degrees C
    a. Do not enter the corrected temperature; the prep log performs this calculation.
    b. Entering the temperature will automatically populate the date/time/initials of when samples were placed in the oven.
    c. The correction factor of the thermometer ID associated with the DW oven 10WET49 will calculate and display the corrected temperature based on the observed temperature you recorded.

    ** If you notice that the thermometer ID, oven ID or correction factor of the equipment in use does not match what is populated in the prep log you must notify QA immediately so that the prep log can be revised.*
11. Click the Disk icon at the top of the prep log to save your work.
    a. In the Batch Group pop up window save the prep log using the naming scheme: ***Batch# HBN# DW***
12. At this point you can either start another batch/prep log or log out and move onto a different task.

Reopening a new Prep Log for your batch:

1. Launch the Balance Utility (BalUtil).
2. Log into the Workbench
3. Click on the Magnifying Glass icon
4. Click drop down arrow for "search criteria".
5. Search for the batch you plan to work with by Analyst Initials, HBN#, Batch#, or Batch Group Name.
6. Double click on the batch to reopen the prep log.
7. In the top, Batch pane, double click the field under "Oven Temp Out1" and enter the observed oven temperature.
8. In the top, Batch pane, double click the field under "Desic. In1" and enter the Instrument ID for the desiccator "10WET50".

Attachment I – Dry Weight Prep Log Instruction (continued)

Pace Analytical	Document Name: Dry Weight Prep Log Instructions	Document Revised: 02Apr2014 Page 2 of 2
	Document No.: F-MN-C-141-rev.00	Issuing Authority: Pace Minnesota Quality Office

   a. Typing the Instrument ID will autopopulate the date/time/initials of when the samples were placed in the desiccator.

9. Save the prep log.
10. Repeat steps 1-5 above to log back in when taking samples out of the desiccator.
11. In the top, Batch pane, double click the field under “Desic. Out1” and enter 10WET50 to document the date/time/initials you removed the samples from the desiccator.
12. Click the Balance icon to the left of the AutoPost button to connect the balance to the prep log.
13. In the bottom, middle, Sample pane, double click in the field under Dry Weight 1 for the first sample.
    a. Place the sample on the balance and press the red Balance Button to send the weight to prep log.
    b. Repeat for all samples in batch.
    a. The TS Posted (%) and the Percent Moisture data will autopopulate based on the dry weight entered.
14. Add any batch notes or sample notes to the prep log as necessary. The Batch Notes field in the top pane can be used to document items that affect the whole batch. The Sample Notes field in the bottom, middle pane can be used to document items that are specific to that sample. Remember that all of these fields can be viewed by clients via a data package; take care to ensure spelling and grammar are correct and that no client/proprietary information is revealed.
15. Click the Disk icon to save your work.
16. Review your data entries and verify all of the information in the prep log is correct for your batch, click on “AutoPost” to send your data to Epic Pro.
    *Note: once you autopost data you cannot make any changes to the prep log. See your supervisor in the event that any edits are needed after autoposting.
17. At this point you can either work with another batch/prep log or log out and move onto a different task.

Dry Weight Prep Log Review and Validation:

1. Log into Epic Pro (LIMS)
   a. Click Batching, Edit, By Batch.
   b. Queue: MPRP, Batch: see prep log for this information.
   c. Review the CC column, all entries should be “OK” and the A column should have a (*).
   d. Click on Systems, F9, Validation Report to generate validation report as a PDF to view onscreen.
   e. Click on Batching, Data Review.
   f. Verify Percent Moi column against the information on the validation report.
   g. Double click the status box, click OK, save.
2. Log into the Work Bench (Electronic Prep Log)
   a. Click on the Magnifying Glass icon and search for the batch you want to review.
   b. After you have reviewed the data, click “Review”. This will autopopulate the date/time/initials, documenting when you performed the review.

Pace Analytical Services, Inc.
1700 Elm Street SE, Suite 200
Minneapolis, MN 55414

Phone: 612-607-1700
Fax: 612-607-6444

STANDARD OPERATING PROCEDURE

PREPARATION OF SOLID SAMPLES AND WIPES FOR ANALYSIS BY ICP AND ICP-MS

Reference Methods: EPA 3050B

Local SOP Number:	S-MN-I-460-rev.17
Effective Date:	Date of Final Signature
Supersedes:	S-MN-I-460-rev.16

APPROVALS

John ... 5/1/2014
Laboratory Assistant General Manager — Date

Melanie Ollila 02May2014
Laboratory Quality Manager — Date

PERIODIC REVIEW

SIGNATURES BELOW INDICATE NO CHANGES HAVE BEEN MADE SINCE PREVIOUS APPROVAL.

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TABLE OF CONTENTS

SECTION PAGE

1. Purpose/Identification of Method

1.1. The purpose of this SOP is to establish a procedure for the digestion of solid samples and wipes to be analyzed by ICP and ICP-MS as described in EPA Method 3050B.

2. Summary of Method

2.1. Inductively coupled plasma atomic emission spectroscopy (ICP-AES) and inductively coupled plasma mass spectrometry (ICP-MS) are utilized for the determination of metals in solution. The method is applicable to a large number of matrices.

2.2. The samples are digested in concentrated nitric acid, hydrochloric acid and hydrogen peroxide. After digestion, samples are filtered (unless ICPMS) and brought to volume.

3. Scope and Application

3.1. **Personnel**: The policies and procedures contained in this SOP are applicable to all personnel involved in the analytical method or non-analytical process.

3.2. **Parameter**s: Not applicable to this SOP.

4. Applicable Matrices

4.1. This SOP is applicable to solid samples and wipes.

5. Limits of Detection and Quantitation

5.1. Not applicable to this SOP.

6. Interferences

6.1. Not applicable to this SOP.

7. Sample Collection, Preservation, Shipment and Storage

7.1. Table 7.1 – Sample Collection, Preservation, Shipment and Storage

Sample type	Collection per sample	Preservation	Storage	Hold time
Solid	Plastic or glass containers. Pre-cleaned containers are purchased from a supplier.	N/A	Above freezing but below 6°C until digested if samples are to be tested for mercury too	Must be analyzed within 6 months of collection.

8. Definitions

8.1. Definitions of terms found in this SOP are described in the Pace Analytical Services Quality Manual, Glossary Section.

9. Equipment and Supplies (Including Computer Hardware and Software)

9.1. Table 9.1 – Equipment and Supplies

Supply	Description	Vendor/Item #/Description
Mechanical pipettes	Various sizes	Fisher Scientific or equivalent
Digestion Cups	50 mL	Environmental Express
Filtermate Plunge filters	2 um PTFE SC0401	Environmental Express
Hot Block ™	54 Place Hot Block	Environmental Express

Reflux Caps	Caps with a center hole	Environmental Express
Analytical Balance	Ability to weigh to the nearest 0.01g	Fisher Scientific or equivalent
Resin beads	For solid matrix QC	Environmental Express or equivalent
Ghost Wipes	Meet ASTM E1792 criteria	Environmental Express

10. Reagents and Standards

10.1. Table 10.1 – Reagents and Standards

Reagent/Standard	Concentration/Description	Requirements/Vendor/Item #
De-ionized (DI) water	ASTM Type II	Verify that background levels of volatile compounds are acceptable by analysis
Hydrogen Peroxide	30% ACS Grade	Fisher brand
Hydrogen Peroxide	30%, Optima Grade for tin only	Fisher brand
Concentrated nitric acid (HNO_3)	Trace Metal grade	Fisher brand
Concentrated hydrochloric acid (HCl)	Trace Metal grade	Fisher brand
ICP Spike - Stock solution standards for LCS and MS/MSD	The solution identifications are PA-STD-1B, PA-STD-2B and PA-STD-3B. See 10.1.1.	Purchased from Inorganic Ventures (or equivalent). Store at room temperature. Expires as specified by manufacturer.
ICP-MS Spike - Stock solution standards for LCS and MS/MSD	The solution identifications are XFSPA-656-250, XFSPA-221-250 and XFSPA-220-250. See 10.1.2.	Purchased from Spex CertiPrep (or equivalent). Store at room temperature. Expires as specified by manufacturer.

10.1.1. ICP Stock Standards Table

PA-STD-1B		**PA-STD-2B**		**PA-STD-3B**	
element	mg/L	element	mg/L	element	mg/L
As	200	Ag	100	Al	2000
Ba	200	B	200	Ca	2000
Be	200	Mo	200	Fe	2000
Cd	200	Sb	200	K	2000
Co	200	Sn	200	Mg	2000
Cr	200	Ti	200	Na	2000
Cu	200	Zr	200		
Li	200	Si	1000		
Mn	200				
Ni	200				
P	200				
Pb	200				
Se	200				
Sr	200				
Tl	200				
V	200				
Zn	200				

10.1.2. ICPMS Stock Standards Table

XFSPA-656-250		XFSPA-221-250		XFSPA-220-250	
Element	(µg/L)	Element	(µg/L)	Element	(µg/L)
Ca	250	Si	250	Ir	20
Fe	250	Sb	20	Pd	20
Mg	250	As	20	Pt	20
K	250	Sn	20		
Na	250				
Se	20				
Al	20				
Ba	20				
Be	20				
Bi	20				
B	20				
Cd	20				
Ce	20				
Cs	20				
Cr	20				
Co	20				
Cu	20				
La	20				
Li	20				
Mo	20				
Mn	20				
Pb	20				
Ni	20				
Ag	20				
Sr	20				
Tl	20				
V	20				
Zn	20				
U	20				

10.2. Table 10.2 - Working Standard Dilutions and Concentrations

Standard	Standard(s) Amount	Solvent	Solvent Volume	Final Total Volume	Final Concentration
Working LCS/MS Spike Solution. See 10.2.1	50 mL of each standard solution (PA-STD-1B, PA-STD-2B, PA-STD-3B)	DI water	50 mL	200 mL	Varies

10.2.1. Store at room temperature. Expires in 3 months.

11. Calibration and Standardization

11.1. Calibrate variable and fixed volume pipettes as specified in SOP S-MN-Q-264 – Support Equipment (or equivalent replacement). Calibration records are kept in the QA Office.

11.2. Calibrate the thermometer as specified in SOP S-MN-Q-264 – Support Equipment (or equivalent replacement). Calibration records are kept in the QA Office.

12. Procedure

12.1. Sample Preparation

12.1.1. Mix the sample thoroughly to achieve homogeneity. For each digestion procedure, weigh a 1-1.5g portion of sample (to the nearest 0.01g) and transfer to a 50 mL digestioncup. Alternative sample volume may be used based on sample matrix. Weigh out 3 aliquots for the batch QC sample (background, matrix spike (MS), and matrix spike supplicate (MSD) being sure to weigh them as close to the same weight as possible.

12.1.1.1. For wipes, place the entire wipe in plastic digestion cup.

12.1.1.1.1. Create a method blank and a laboratory control sample (LCS) by weighing out 1 gram of resin beads for each. For wipes, use blank wipes for the method blank and laboratory control sample(LCS).

12.1.1.1.2. Spike the LCS.

12.1.2. Add 10mL of DI water to each sample.

12.1.3. Add 7.5mL of concentrated HNO3, mix the slurry, and cover with a reflux cap. Heat the sample to 95 +/- 2°C and reflux for 70 minutes without boiling. Observe the sample during heating for brown fumes indicating oxidation of the sample. If this occurs, add up to an additional 5 mL HNO3 and re-heat. Repeat this process until no fumes are given off during heating. Record on the digestion log to what samples and how much additional acid was added.

Note: record initial Hot Black temperature in the digestion log.

12.1.4. Cool the sample 10 minutes. Add 2.5mL of 30% hydrogen peroxide. Cover with reflux cap and return to the Hot Block for warming which will start the peroxide reaction. Care must be taken to ensure that losses do not occur due to vigorous effervescence. Heat until effervescence subsides for a total of 10 minutes. Cool the samples in the plastic cups.

Note: use Optima grade hydrogen peroxide if the analysis of tin (Sn) is required. Tin is used as a stabilizer in the ACS grade of hydrogen peroxide.

12.1.4.1. If effervescence does not subside, continue to add 30% hydrogen peroxide in 1mL aliquots with warming until the effervescence is minimal or until the general sample appearance is unchanged. Note in the comments section of prep sheet the additional aliquots.

12.1.4.1.1. NOTE: Do NOT add more than a total of 10mL hydrogen peroxide.

12.1.5. Add 5mL of concentrated HCl, return the sample to the Hot Block and reflux for an additional 15 minutes without boiling.

12.1.6. Remove samples from Hot Block and record final temperature in digestion log. Allow samples to cool. Bring samples up to a final volume of 50 ml with DI water. Invert several times for good mixing. FOR ICP-MS sample prep, cap and label samples for analysis – do not filter if analyzed by ICPMS.

12.1.7. For ICP-AES, samples may be allowed to sit overnight while solid materials settle out or samples may be filtered. If filtered, use FilterMate plunge filters following manufacturers instructions. If samples are filtered all QC samples including the method blank and laboratory control sample (LCS) must also be filtered.

12.1.7.1. Note: The method modifications that have been utilized have been defined in the above process have been demonstrated effective in MDLs, DOCs, successful PTs, and ongoing precision and accuracy data samples.

12.2. Documentation

12.2.1. Standard Prep Logbook: Record the necessary information in the prep logbook, including source, lot numbers, volumes utilized, and expiration date.

12.2.2. Digestion Logbook

12.2.2.1. Record the necessary information in the digestion log book including sample ID, initial and final volumes, prep date, prep analyst, and lot numbers of solutions used, including spike solutions and LCS solutions.

12.2.2.2. Also include any additional comments if needed.

12.2.3. Temperature Logbook

12.2.3.1. Record the temperature of each hot block daily in the temperature logbook.

12.2.3.2. Use a NIST-traceable thermometer inserted into a digestion cup filled with 50mL of DI to measure the temperature of the hot block. The temperature should be checked in different wells of the Hot Blocks such that all wells are evaluated over a period of time.

13. Quality Control

13.1. Table 13.1 – Quality Control

QC Sample	Components	Frequency	Acceptance Criteria	Corrective Action
Preparation Blank	A clean matrix similar to the samples. For solids, 1.0 grams of resin beads. For wipes, use a new Ghost Wipe.	Prepared with each batch	See appropriate analysis SOP.	See appropriate analysis SOP.
Laboratory Control Sample (LCS)	For solids, weigh 1.0 gram of resin beads. For wipes, use a new Ghost Wipe. Spike with appropriate spiking solutions.	Prepared with each batch	See appropriate analysis SOP.	See appropriate analysis SOP.
Matrix Spike (MS) / Matrix Spike Duplicate (MSD)	Weigh out similar amounts of soil as the parent sample; be sure to weigh QC sample and MS/MSD samples as close as possible. Spike with appropriate spike solutions and record in digestion log.	Prepared with each batch of samples. Client specific requirements may result in a greater number of MS or MS/MSD sets in a batch.	See appropriate analysis SOP.	See appropriate analysis SOP.
Duplicate (DUP)	In some cases the client may request a duplicate in lieu of an MSD. This is weighed out in similar amount (as close as possible) to the background sample.	As requested.	See appropriate analysis SOP.	See appropriate analysis SOP.

14. Data Analysis and Calculations

14.1. Not applicable to this SOP.

15. Data Assessment and Acceptance Criteria for Quality Control Measures

15.1. See table in section 13.

16. Corrective Actions for Out-Of-Control Data

16.1. See table in section 13.

17. Contingencies for Handling Out-Of-Control or Unacceptable Data

17.1. If not specifically listed in the table in section 13, the contingencies are as follows. If there is no additional sample volume to perform re-analyses, all data will be reported as final with applicable qualifiers. If necessary, an official case narrative will be prepared by the Quality Manager or Project Manager.

18. Method Performance

18.1. All applicable personnel must read and understand this SOP with documentation of SOP review maintained in their training files.

18.2. **Method Detection Limit (MDL) Study**: An MDL study must be conducted annually (per the method) per S-MN-Q-269 – Determination of Limit of Detection and Limit of Quantitation (or equivalent replacement) for each matrix per instrument.

18.3. **Demonstration of Capability (DOC)**: Every analyst who performs this method must first document acceptable accuracy and precision by passing a demonstration of capability study (DOC) per S-ALL-Q-020 - Training Procedures (or equivalent replacement).

18.4. **Periodic performance evaluation (PE)** samples are analyzed to demonstrate continuing competence per SOP S-MN-Q-258 – Proficiency Testing Program (or equivalent replacement). Results are stored in the QA office**.**

19. Method Modifications

19.1. The preparation method has been modified in terms of the amounts of reagents used and the individual heating times. The chemistry is maintained. Part of the reason for this modification is better performance for silver and antimony. PT samples are analyzed regularly to validate that the modifications are effective. Per the method, the nitric acid and peroxide amounts are varied based on the sample reaction and this is the case with the Pace method. Overall, the Pace digestion ends up with a higher total acid concentration.

19.2. The final volume for the Pace method is 50 mL, opposed to 100 mL for the reference method.

19.3. Samples are processed using the Hot Block digestion system employing metals free disposable plastic ware rather than glass beakers.

20. Instrument/Equipment Maintenance

20.1. Please refer to the specific manufacturer’s instrument manual for maintenance procedures performed by the lab.

20.2. All maintenance activities are listed daily in maintenance logs that are assigned to each separate instrument.

20.3. Logs are kept daily for each hot block, monitoring temperature. The temperature probe is varied daily so that each individual hot block sample cell is monitored to ensure consistency across the block.

21. Troubleshooting

21.1. Not applicable to this SOP.

22. Safety

22.1. Standards and Reagents: The toxicity and carcinogenicity of standards and reagents used in this method have not been fully defined. Each chemical compound should be treated as a potential health hazard. Reduce exposure by the use of gloves, lab coats and safety glasses. Material Safety Data Sheets (MSDSs) are on file in the laboratory and available to all personnel. Standard solutions should be prepared in a hood whenever possible.

22.2. Samples: Take precautions when handling samples. Samples should always be treated as potentially hazardous “unknowns”. The use of personal protective equipment (gloves, lab coats and safety glasses) is required when handling samples. In the event a sample container must be opened, it is recommended to perform this in a hood whenever possible.

23. Waste Management

23.1. Procedures for handling waste generated during this analysis are addressed in S-MN-S-003 - Waste Handling and Management (or equivalent replacement).

23.2. In order to minimize the amount of waste generated during this procedure, analyst should prepare reagents in an amount which may be used in a reasonable amount of time (e.g., before a reagent expires).

24. Pollution Prevention

24.1. The company wide Chemical Hygiene and Safety Manual contains information on pollution prevention.

25. References

25.1. Pace Quality Assurance Manual- most current version.

25.2. National Environmental Laboratory Accreditation Conference (NELAC), Chapter 5, "Quality Systems"- most current version.

25.3. The NELAC Institute (TNI); Volume 1, Module 2, "Quality Systems"- most current version.

25.4. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, Third Edition. Method 3050B

26. Tables, Diagrams, Flowcharts, and Validation Data

26.1. Not applicable to this SOP.

27. Revisions

Document Number	Reason for Change	Date
S-MN-I-460-Rev.16	Implemented new corp-issued SOP format Removed "or Deena" from hot block in equipment list 12.1.1.2.1 – added 12.1.5 – added "do not add HCl…"	26Feb2013
S-MN-I-460-Rev.17	Title changed/1.1/4.1 – removed Filters 2.1 – removed matrices 9.1/10.1/13.1 - updated 12.1.1 – added 'Weigh out 3 aliquots…' 12.1.1.1 – removed filters 12.1.1.1.1 – adeed 12.1.1.1.2 – removed words after 'LCS' 12.1.4 – removed 5 mins; added note to and removed 12.1.5 12.1.5 – removed '(do not add…)' 12.1.6 – added 'invert several times…' 12.1.7 – modified 19.1 – 19.2 – modified; added 19.3 20.3 - added Removed DoD section from section 25	31Mar2014

Pace Analytical Services, Inc.
1700 Elm Street SE, Suite 200
Minneapolis, MN 55414

Phone: 612-607-1700
Fax: 612-607-6444

STANDARD OPERATING PROCEDURE

INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROSCOPY

Reference Methods: EPA 6010B, 6010C, and EPA 200.7

Local SOP Number:	S-MN-I-313-rev.25
Effective Date:	Date of Final Signature
Supersedes:	S-MN-I-313-rev.24

APPROVALS

John T Rice _______ 5/1/2014
Laboratory Assistant General Manager — Date

Melanie Ollila _______ 01May2014
Laboratory Quality Manager — Date

PERIODIC REVIEW

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SECTION PAGE

1. Purpose/Identification of Method

1.1. The purpose of this SOP is to establish a procedure for the determination of metals by inductively coupled plasma atomic emissions spectroscopy (ICP-AES) as delineated in EPA Method 6010B, 6010C or 200.7.

2. Summary of Method

2.1. Prior to analysis, samples must be solubilized or digested using appropriate sample preparation methods.

2.2. This method describes the determination of elements by ICP-AES. The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific atomic-line emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the lines are monitored by a charge coupled device detector.

2.3. Background correction may be required. Background is measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used should be free of spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences should also be recognized and appropriate corrections made as necessary.

3. Scope and Application

3.1. **Personnel**: The policies and procedures contained in this SOP are applicable to all personnel involved in the analytical method or non-analytical process.

3.2. **Parameter**s: This SOP applies to the elements listed in Attachment I.

4. Applicable Matrices

4.1. This SOP is applicable to ground water, aqueous samples, leachates, industrial wastes, soils, sludges, sediments, and other solid wastes.

5. Limits of Detection and Quantitation

5.1. The reporting limit (LOQ) for all analytes is listed in Attachment I. All current MDLs are listed in the LIMS and are available by request from the Quality Manager.

6. Interferences

6.1. Spectral Interferences are caused by background emission from continuous or recombination phenomena, stray light from the line emission of high concentration elements, overlap of a spectral line from another element, or unresolved overlap of molecular band spectra.

6.1.1. Spectral overlap can be compensated by computer-correcting the raw data after monitoring and measuring the interfering element. Unresolved overlap requires selection of an alternate wavelength. Background contribution and stray light can usually be compensated for by a background correction adjacent to the analyte line. Interelement correction factors are used on the simultaneous ICP.

6.2. Physical Interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or high acid concentrations. If physical interferences are present, they must be reduced by diluting the sample, by using a peristaltic pump, by using an internal standard, or by using a high solids nebulizer. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, affecting aerosol flow rate and causing instrument drift.

6.3. Chemical interferences include molecular compound formation, ionization effects and solute vaporization effects. Normally, these effects are not significant with the ICP technique, but if observed, can be minimized by careful selection of operating conditions (incident power, observation position, and so forth), but buffering the sample, by matrix matching, and by standard addition procedures.

6.4. Memory interferences result when analytes in a previous sample contribute to the signals measured in the new sample. Memory effects can result from sample deposition on the uptake tubing to the nebulizer and from buildup of sample material in the plasma torch and spray chamber.

6.5. Users are advised that high salt concentrations can cause analyte signal suppressions and confuse interference tests.

7. Sample Collection, Preservation, Shipment and Storage

7.1. Table 7.1 – Sample Collection, Preservation, Shipment and Storage

Sample type	Collection per sample	Preservation	Storage	Hold time
Liquid	Glass containers. Collect dissolved metal samples and filter immediately through a 0.45-micron filter on-site by the sampler before adding preservative. If samples are filtered at the laboratory, use a polyethylene or glass container and preserve after filtration with HNO_3.	Preserve immediately with HNO_3 to bring the pH to <2 For samples received with a pH>2, additional nitric acid must be added upon receipt to dissolve the metals that may have adhered to the sample container. Sample receiving adds the additional acid, labels the samples with the amount of acid added, the lot number of the acid, date, time and initials of person that added the acid. The samples must not be analyzed for 24 hours from acid addition per the Method Update Rules.	Store total and dissolved metal samples at room temperature.	The maximum sample holding time for metals is 6 months from sample collection.
Solid	Glass or polyethylene container	N/A	Above freezing but below 6^{o}C.	The maximum sample holding time for metals is 6 months from sample collection.

8. Definitions

8.1. Definitions of terms found in this SOP are described in the Pace Analytical Services Quality Manual, Glossary Section.

9. Equipment and Supplies (Including Computer Hardware and Software)

9.1. Table 9.1 – Equipment and Supplies

Supply	Description	Vendor/Item #/Description
Perkin Elmer Optima	4300 (or equivalent)	
Desktop computer and printer		
Perkin Elmer AS 93	Plus Autosampler	

Peristaltic pump and Fisherbrand pump tubing, or equivalent.		
Refrigerated Circulator		
Argon gas supply	high-purity grade, 99.99%	House Argon
Mechanical pipettes, and metals-free disposable pipet tips		
Glassware	Class A volumetric flasks, graduated cylinders and funnels (glass or metals-free class B plastic).	
Disposable digestion cups	50 mL	
Epic Pro	Data reporting software	See master list for current version
LimsLink	Data transmission software	See master list for current version
WinLab 32 ICP Continuous	Automated Analysis Control	See master list for current version

10. Reagents and Standards

10.1. Table 10.1 – Reagents and Standards

Reagent/Standard	Concentration/Description	Requirements/Vendor/Item #
De-ionized Water	ASTM Type II	House DI water
Concentrated Hydrochloric acid (HCl)	Trace Metals grade	Fisher
Concentrated Nitric Acid (HNO3)	Trace Metals grade	Fisher
Calibration Standard Stock Solutions	Custom blend	Spex Certiprep or equivalent
Initial Calibration Verification (ICV) Stock Standard solutions	Custom blend. Must be separate stock from the calibration standards.	CPI or equivalent
Profiling Solution	Manganese, at a concentration of 1 mg/L or 10 mg/L, is used to profile the system	
Internal Standards (optional)	Scandium (1 mg/L) or Yttrium (5 mg/L) may be used as an internal standard	

10.2. Table 10.2 - Working Standard Dilutions and Concentrations

10.2.1. See Attachment VII – ICP Standard Prep Log 8632

11. Calibration and Standardization

11.1. Table 11.1 – Calibration and Standardization

Calibration Metric	Parameter/Frequency	Criteria	Comments
Initial Calibration (ICAL)	Instruments must be calibrated at a minimum once every 24 hours or prior to use. The instrument standardization date and time must be included in the raw data. See Attachment VI for an example run sequence. A calibration curve must consist of a blank and at least one calibration standard	Linear regression: $r \geq 0.995$ for 6010B, 200.7 $r \geq 0.998$ for 6010C	If not met, remake standards and recalibrate and verify before sample analysis.
Second Source Verification Standard (ICV)	Immediately after the calibration standards have been analyzed, the accuracy of the initial calibration shall be verified and documented for every analyte by the analysis of an ICV Solution(s) at each	± 10% for method 6010B and 6010C or ± 5% for method 200.7 The RSD of the standards must be below 5% for 6010 and 3% for 200.7 W of the replicate readings.	Review the standard preparation. Remake the standard accordingly if that is the cause. Re-inject the ICV one more time, if it fails stop all analysis. Perform all necessary

	wavelength used for analysis. The Initial Calibration Verification (ICV) Solution(s) should be obtained from a different source than the calibration standards.		instrument maintenance and recalibrate the instrument. Only two injections are allowed back to back, then the system must be recalibrated.
Continuing Calibration Verification (CCV)	To ensure calibration accuracy during each analytical run, a CCV standard must be analyzed after every 10 samples and at the end of the run for each wavelength. The ICV solution can be utilized as the CCV.	For method 6010B, 6010C and 200.7, the CCV must be within ± 10% of the true value. The RSD of the standards must be below 5% for 6010 and 3% for 200.7 W of the replicate readings.	If the requirements for continuing calibration are not met, review for preparation error or instrument malfunction. A CCV may be repeated, but a second failure requires the system to be recalibrated prior to further analysis. If the samples bracketed are non-detect and the CCV is biased high, data may be reported as there is no impact from the high bias. If the samples associated are non-detect and the only detections are associated with the batch QC (LCS/MS) but the QC is within limits, the data can be reported. The QC should be flagged indicating that there was bias but that there was no impact to the associated samples. If the CCVs are biased low, reanalyze any samples impacted since the last passing CCV.
6010B/200.7 - Contract Required Detection Limit Sample (CRDL)	The CRDL must be analyzed at the beginning of each run for every analyte of interest. The CRDL is at or below the RL.	± 40% (or specified by the client)	. The system must be stopped. Perform any necessary maintenance and recalibrate accordingly.
6010C – Low Level Initial/Continuing Calibration Verification (LLICV/LLCCV)	The LLICV must be analyzed following the ICV at a concentration at or below the RL. Additionally, a LLCCV (may be the same solution as the LLICV) must be analyzed at a frequency of once at the end of each analytical batch, preferably every 10 samples following the CCV to minimize sample re-runs.	± 30%	. The system must be stopped. Perform any necessary maintenance and recalibrate accordingly.
Initial Calibration Blank (ICB)	An ICB must be analyzed immediately following ICV	All elements of interest must be evaluated to the method detection limit. Depending on the data	. If an analyte of interest is greater than the RL, the sample concentration must

	for each element of interest.	quality objective of the associated projects, a blank with detections less than the RL may be considered acceptable	be greater than 10 times the blank concentration or the element cannot be reported. If associated projects are evaluated to the method detection limits per data quality objects, the detections must be evaluated for data impact and the system evaluated for necessary corrective actions.
Continuing Calibration Blank (CCB)	A CCB must be analyzed, for each element of interest after every CCV within the analytical run and after the final CCV.	All elements of interest must be evaluated to the method detection limit. Depending on the data quality objective of the associated projects, a blank with detections less than the RL may be considered acceptable.	If an analyte of interest is greater than the RL, the sample concentration must be greater than 10 times the blank concentration or the element cannot be reported. If associated projects are evaluated to the method detection limits per data quality objects, the detections must be evaluated for data impact and the system evaluated for necessary corrective actions.
Interelement Correction Standard A (ICSA)	A solution containing high concentrations of Al, Ca Fe and Mg is analyzed at the beginning of each sample run sequence	Acceptance criteria for the spiked interferent elements are ± 20% and ± 2X the RL for target analytes.	If the ICSA fails criteria, stop analysis. Review the standard preparation, remake accordingly. Perform any necessary maintenance and recalibrate prior to sample analysis. Additional corrective actions may be required for client specific QAPP and Technical Specifications
Interelement Correction Standard AB (ICSAB)	A solution containing high concentrations of Al, Ca, Fe and Mg and low to mid-range concentrations of the target analytes is analyzed following the ICSA This is required by certain clients. It is not a method requirement and need be analyzed only for clients specifying this in the QAPP	The acceptance criteria are ± 20%.	If the ICSAB fails criteria, stop analysis. Review the standard preparation, remake accordingly. Perform any necessary maintenance and recalibrate prior to sample analysis. Additional corrective actions may be required for client specific QAPP and Technical Specifications

12. Procedure

12.1. Instrument Set up and Operation

12.1.1. Perform the daily maintenance if needed (change pump tubing, fill rinse solution container, drain waste container, etc.) and record in the daily maintenance log.

12.1.2. Start the ICP and let it warm up.

12.1.2.1. Check the gas supply.

12.1.2.2. Confirm the water circulator/chiller is on.

12.1.2.3. Turn on the computer.

12.1.2.4. Double click on the Optima (WinLab32) program icon. Open the workspace that has the method to run: it will open as well.

12.1.2.5. Click on the plasma icon.

12.1.2.6. Click on the startup/shutdown button.

12.1.2.7. The software will go through several steps until the argon is ignited. Check to be sure the gas flow and pump speed are correct. If not, make changes and click on Apply

12.1.2.8. Close the window.

12.1.3. Create an auto sampler file and pour samples into the corresponding location in the auto sampler tray.

12.1.3.1. Open sample information table by clicking on the button for Sample Info.

12.1.3.2. Click on New/File.

12.1.3.3. Enter in the batch ID, the name of the analyst and standard log numbers. Go down to the table and type in the samples to be analyzed.

12.1.3.4. Click on File Save As and type Date for the data file (which is usually the same as the batch ID).

12.1.3.5. Click on Setup and click on Open to choose which results data set to use. Choose or type in the data set, click OK.

12.1.3.6. Click on Analyze tab. Click on rebuilt list or reset sequence buttons to put the sample information into the analyze window.

12.1.3.7. Print the Sample Info page to get the run log.

12.1.4. Pour the standards and start the calibration of the instrument.

12.1.5. Monitor all initial QC checks. If initial QC fails, make instrument modifications and recalibrate. If checks pass criteria, continue with sample analysis.

12.1.6. During the sample analysis or after the analysis is completed, transfer valid data into LIMS system.

12.1.7. In LIMS system enter any dilutions and any required footnotes. Print validation lists and complete checklist. Turn data in for validation.

12.1.8. ICP Routine Maintenance:

12.1.8.1. Change pump tubing if there is visible wear or flat spots.

12.1.8.2. Change filters as needed.

12.1.8.3. Clean optic window as needed.

12.1.8.4. Empty the waste container as needed.

12.1.8.5. Replace the torch as needed.

12.1.8.6. Clean injector as needed.

12.2. Sample Analysis

12.2.1. Load samples and batch QC into designated autosampler locations making sure the correct spot is used.

12.2.2. Start analytical procedure.

12.2.3. Monitor results and standard recoveries for problems.

12.2.4. At the end of the analytical run, perform the manual shut down.

12.2.4.1. If the analysis extends past working hours, set the instrument up for auto shutdown.

12.3. Daily File

12.3.1. Gather daily printouts.
12.3.2. Print out instrument raw data.
12.3.3. Include calibration summaries and runlogs.
12.3.4. Update and include necessary standard prep logs.
12.3.5. Label the daily file folder with date and instrument information.

13. Quality Control

13.1. Table 13.1 – Quality Control

QC Sample	Components	Frequency	Acceptance Criteria	Corrective Action
Method Blank (MB)	DI water for liquid samples Resin beads for solid samples	Prepared and analyzed with each group of samples digested. For 6010C - Carried through the appropriate steps of the analytical process. These steps may include, but are not limited to, prefiltering, digestion, dilution, filtering and analysis.	< absolute value of the reporting limit (RL) For 6010C - If the method blank does not contain target analytes at a level that interferes with project-specific DQOs, then the method blank would be considered acceptable.	If the concentration in the MB is greater than the RL, samples associated with that MB must be re-prepared, unless the samples are non-detect or greater than 10X the blank contamination. When reporting data with a hit in the MB, all samples affected will be footnoted with the appropriate flag to document contamination in the blank.
Laboratory Control Sample (LCS)	DI water for liquids and resin beads for solids, spiked with analytes of interest at same level as MS/MSD	Prepared and analyzed for every batch of 20 or less samples digested	80-120% for 6010B and 6010C 85-115% for 200.7	If the percent recovery for the LCS falls outside the control limits of 80-120% for 6010B and 6010C or 85-115% for 200.7, the analyses should be terminated, the problem corrected, and the samples associated with that LCS re-analyzed. If reanalysis of the samples fail, the samples affected by the failing LCS elements need to be re-digested and re-analyzed. ***<u>EXCEPTION:</u>*** if LCS fails high and samples are ND the data may be reported with appropriate qualification.
Matrix Spike (MS) / Matrix Spike Duplicate (MSD)	The spike is added to a well-mixed aliquot of a selected sample before the digestion (i.e., prior to the addition of other reagents).	One MS/MSD per batch. If >10 samples for 200.7, an additional MS is required. Clients may have requirements that create a higher frequency of MS/MSD samples.	75-125% for 6010B and 6010C 70-130% for 200.7 % RPD: 20% for 6010B/C; 20% for 200.7	If the percent recovery for the MS and MSD fall outside the control limits, the results are flagged that they are outside acceptance criteria along with the parent sample. If the RPD exceeds the acceptance criteria, the MSD sample and associated parent sample need to be flagged. For Minnesota Admin Contract clients – all MS/MSD failures require reanalysis of the MS/MSD and the original sample. If it is still out of control, investigate and document the

				cause in the associated narrative as well as qualifying appropriately.
Post Digestion Spike (PDS)	Spike is added to the native QC sample at the same concentration as the MS but at the instrument.	Required if reporting by 6010C and MS/MSD fail outside 75-125% and if the PDS also fails then a 5x dilution is made of the PDS.	75-125% for 6010B and 80-120% for 6010C	If PDS fails data is qualified
Internal Standard	The same concentration should be used for standards and samples throughout the entire analytical run.	Introduced automatically with every sample.	70-130% of its true concentration	If the recovery is outside the criteria, sample is reanalyzed at a 5X dilution.

13.2. If matrix interference is suspected, a serial dilution may be performed. One serial dilution test may be performed per batch of twenty samples per client contractual requirements. An analysis of a 1:5 dilution should agree within ± 10% of the original result. Additional dilutions may be required.

13.3. When reviewing total and dissolved metals, an RPD of ≤ 20% is considered to be within experimental error.

14. Data Analysis and Calculations

14.1. The percent recovery of the spike is calculated from the following equation:

$$\%\ \text{Recovery} = \frac{(\text{SSR-SR}) \times 100}{\text{ST}}$$

Where: SSR = Spike sample result, ug/L or mg/kg dry
SR = Sample result, ug/L or mg/kg dry
ST = Spike target, ug/L or mg/kg dry

14.2. The relative percent difference between the MS/MSD can be calculated as follows:

$$\text{RPD} = \frac{|(\text{S-D})| \times (100)}{(\text{S+D})/2}$$

Where: RPD = Relative Percent Difference
S = Original Spiked Sample Value, ug/L or mg/kg dry
D = Second Spiked Sample Value, ug/L or mg/kg dry

15. Data Assessment and Acceptance Criteria for Quality Control Measures

15.1. See tables in section 11 and 13.

16. Corrective Actions for Out-of-Control Data

16.1. See tables in section 11 and 13.

17. Contingencies for Handling Out-of-Control or Unacceptable Data

17.1. If not specifically listed in the tables in section 11 or 13, the contingencies are as follows. If there is no additional sample volume to perform re-analyses, all data will be reported as final with applicable qualifiers. If necessary, an official case narrative will be prepared by the Quality Manager or Project Manager.

18. Method Performance

18.1. All applicable personnel must read and understand this SOP with documentation of SOP review maintained in their training files.

18.2. **Method Detection Limit (MDL) Study**: An MDL study must be conducted annually (per the method) per S-MN-Q-269 – Determination of Limit of Detection and Limit of Quantitation (or equivalent replacement) for each matrix per instrument.

18.3. **Instrument Detection Limit (IDL) Study**: An IDL study must be conducted quarterly per S-MN-Q-269 – Determination of Limit of Detection and Limit of Quantitation (or equivalent replacement).

18.4. **Demonstration of Capability (DOC)**: Every analyst who performs this method must first document acceptable accuracy and precision by passing a demonstration of capability study (DOC) per S-ALL-Q-020 - Training Procedures (or equivalent replacement).

18.5. **Periodic performance evaluation (PE)** samples are analyzed to demonstrate continuing competence per SOP S-MN-Q-258 – Proficiency Testing Program (or equivalent replacement). Results are stored in the QA office.

19. Method Modifications

19.1. Not applicable for this SOP.

20. Instrument/Equipment Maintenance

20.1. All maintenance activities are listed daily in maintenance logs that are assigned to each separate instrument.

21. Troubleshooting

21.1. Not applicable for this SOP.

22. Safety

22.1. **Standards and Reagents**: The toxicity and carcinogenicity of standards and reagents used in this method have not been fully defined. Each chemical compound should be treated as a potential health hazard. Reduce exposure by the use of gloves, lab coats and safety glasses. Material Safety Data Sheets (MSDSs) are on file in the laboratory and available to all personnel. Standard solutions should be prepared in a hood whenever possible.

22.2. **Samples**: Take precautions when handling samples. Samples should always be treated as potentially hazardous “unknowns”. The use of personal protective equipment (gloves, lab coats and safety glasses) is required when handling samples. In the event a sample container must be opened, it is recommended to perform this in a hood whenever possible.

23. Waste Management

23.1. Procedures for handling waste generated during this analysis are addressed in S-MN-S-003 - Waste Handling and Management (or equivalent replacement).

23.2. In order to minimize the amount of waste generated during this procedure, analyst should prepare reagents in an amount which may be used in a reasonable amount of time (e.g., before a reagent expires).

24. Pollution Prevention

24.1. The company wide Chemical Hygiene and Safety Manual contains information on pollution prevention.

25. References

25.1. Pace Quality Assurance Manual- most current version.

25.2. National Environmental Laboratory Accreditation Conference (NELAC), Chapter 5, "Quality Systems"- most current version.

25.3. The NELAC Institute (TNI); Volume 1, Module 2, "Quality Systems"- most current version.

25.4. Test Methods for Evaluating Water and Solid Waste, SW-846 3rd Edition, Final Update III, Method 6010B.

25.5. Test Methods for Evaluating Water and Solid Waste, SW-846, Method 6010C Update IV, Feb. 2007.

25.6. Perkin Elmer Hardware Guide 1997.

25.7. Perkin Software Guide 2000.

25.8. Method 200.7 Revision 4.4, Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-atomic Emission Spectrometry

25.9. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, Third Edition. Method 3050B

26. Tables, Diagrams, Flowcharts, and Validation Data

26.1. Attachment I - Target Analyte List and Reporting Limits (PRL)

26.2. Attachment II - Trace-ICP Working Calibration Standard

26.3. Attachment III - Trace-ICP Calibration Verification Standard

26.4. Attachment IV - ICSA

26.5. Attachment V - Trace CRDL #2

26.6. Attachment VI - Sample Run Sequence

26.7. Attachment VII – ICP Standards Prep Log 8632

27. Revisions

Document Number	Reason for Change	Date
S-MN-I-313-rev.24	Implemented new corp SOP format 18.3 – added 26.1-26.6 – changed "table" to "attachment" Added – attachment VII	01Aug2013
S-MN-I-313-rev.25	1.1/2.2 – added 'AES' to ICP 2.2 – edited Table 7.1 – updated sample type Table 9.1/10.1/11.1/13.1 – updated Added and changed method criteria (RPD) to 20% Added PDS criteria and frequency Removed DoD reference from section 25	30Apr2014

ATTACHMENT I – Target Analyte List and Reporting Limits (PRL)

Element	Wavelength [1](nm)	Water PRL (ug/L)	Soil PRL (mg/kg)
Aluminum	396	200	10
Antimony	217	20	1.0
Arsenic	193	20	1.0
Barium	233	10	0.50
Beryllium	313	5.0	0.25
Boron	249	150	7.5
Cadmium	228	3.0	0.15
Calcium	317	500	25
Chromium	267	10	0.50
Cobalt	228	10	0.50
Copper	327	10	0.50
Iron	238	50	2.5
Lead	220	10	1.0
Magnesium	279	500	25
Manganese	257	5.0	0.25
Molybdenum	202	15	0.75
Nickel	231	20	1.0
Potassium	766	2500	125
Selenium	196	20	0.75
Silver	328	10	0.50
Sodium	589	1000	50
Thallium	190	20	1.0
Tin	189	75	3.75
Titanium	334	25	1.25
Vanadium	290	15	0.75
Zinc	206	20	1.0
Hardness	N/A	3300	134

[1]The wavelengths listed are recommended because of their sensitivity and overall acceptance. Other wavelengths may be substituted when using a sequential instrument if they can provide the needed sensitivity and are treated with the same corrective techniques for spectral interference.

ATTACHMENT II – Trace-ICP Working Calibration Standard

Element	Stock Conc. (mg/L)	Aliquot (mL)	Final Volume (mL)	Cal STD Final Conc. (mg/L)
Ag	100	1.0	50	2
Al	2,000	0.5	50	20
As	200	1.0	50	4
Ba	200	1.0	50	4
Be	200	1.0	50	4
Ca	2000	0.5	50	20
Cd	200	1.0	50	4
Co	200	1.0	50	4
Cr	200	1.0	50	4
Cu	200	1.0	50	4
Fe	2000	0.5	50	20
K	2000	0.5	50	20
Mg	2000	0.5	50	20
Mn	200	1.0	50	4
Na	2000	0.5	50	20
Ni	200	1.0	50	4
Pb	200	1.0	50	4
Sb	200	1.0	50	4
Se	200	1.0	50	4
Tl	200	1.0	50	4
V	200	1.0	50	4
Zn	200	1.0	50	4
Mo	200	1.0	50	4
B	200	1.0	50	4
Sn	200	1.0	50	4
Ti	200	1.0	50	4

ATTACHMENT III – Trace-ICP Calibration Verification Standard

Element	Stock Conc. (mg/L)	Aliquot in (mL)	Final Volume (mL)	Final Conc. (mg/L)
Ag	50	1.0	50	1
Al	1000	0.5	50	10
As	100	1.0	50	2
Ba	100	1.0	50	2
Be	100	1.0	50	2
Ca	1000	0.5	50	10
Cd	100	1.0	50	2
Co	100	1.0	50	2
Cr	100	1.0	50	2
Cu	100	1.0	50	2
Fe	1000	0.5	50	10
K	1000	0.5	50	10
Mg	1000	0.5	50	10
Mn	100	1.0	50	2
Na	1000	0.5	50	10
Ni	100	1.0	50	2
Pb	100	1.0	50	2
Sb	100	1.0	50	2
Se	100	1.0	50	2
Tl	100	1.0	50	2
V	100	1.0	50	2
Zn	100	1.0	50	2
Mo	100	1.0	50	2
B	100	1.0	50	2
Sn	100	1.0	50	2
Ti	100	1.0	50	2

ATTACHMENT IV – ICSA

Element	Stock Conc. (mg/L)	Aliquot in (mL)	Final Volume (mL)	Final Conc. (mg/L)
Al	10000	2.5	1000	25
Ca	10000	50	1000	500
Fe	10000	7.5	1000	75
Mg	10000	15	1000	150

ATTACHMENT V – Trace CRDL2

Element	Stock Conc. (mg/L)	Aliquot in (mL)	Final Volume (mL)	Final Conc. (mg/L)
Ag	5	1.0	1000	0.005
Al	100	1.0	1000	0.100
As	5	1.0	1000	0.005
Ba	1.5	1.0	1000	0.0015
Be	5	1.0	1000	0.005
Ca	250	1.0	1000	0.250
Cd	0.5	1.0	1000	0.0005
Co	10	1.0	1000	0.010
Cr	10	1.0	1000	0.010
Cu	5	1.0	1000	0.005
Fe	50	1.0	1000	0.050
K	250	1.0	1000	0.250
Mg	250	1.0	1000	0.250
Mn	5	1.0	1000	0.005
Na	1000	1.0	1000	1.0
Ni	20	1.0	1000	0.020
Pb	3	1.0	1000	0.003
Sb	5	1.0	1000	0.005
Se	5	1.0	1000	0.005
Tl	10	1.0	1000	0.010
V	15	1.0	1000	0.015
Zn	20	1.0	1000	0.020
Mo	15	1.0	1000	0.015
B	75	1.0	1000	0.075
Sn	35	1.0	1000	0.035
Ti	10	1.0	1000	0.010

The CRDL standard is prepared by diluting the CRDL2 standard by a factor of 2.

ATTACHMENT VI – Sample Run Sequence

1. **Calibration Blank**
2. **Calibration Standard**
3. **ICV**
4. **LLICV (6010C)**
5. **ICB**
6. **CRDL (6010B and 200.7)**
8. **CRDL2 (6010B and 200.7)**
9. **ICSA**
10. **ICSAB**
11. **CCV**
12. **LLCCV (6010C)**
13. **CCB**
14. **SAMPLE 1**
15. **SAMPLE 2**
16. **SAMPLE 3**
17. **SAMPLE 4**
18. **SAMPLE 5**
19. **SAMPLE 6**
20. **SAMPLE 7**
21. **SAMPLE 8**
22. **SAMPLE 9**
23. **SAMPLE 10**
24. **CCV**
25. **CCB**
26. **CRDL (project specific)**
27. **CRDL2 (project specific)**
28. **ICSA (project specific)**
34. **ICSAB (project specific)**
35. **CCV**
36. **CCB**

ATTACHMENT VII - ICP Standards Prep Log 8632

ICP standard log 8632

ICP Standards Prep Log 8632												
STD. ID	USED	Standard name	Elements	Initial		exp.date	stock ID	stock lot	stock conc (mg/L)	stock amt. (ml)	final vol. (ml)	Final conc. (ug/L)
N/A	y	Low Standard	N/A	N/A	N/A	N/A	N/A	—	—	10.0	40	5000/1000/500
8632- 2156	y	High Standard	see label	IP	7/24/2013	7/31/2013	8074-666	IV F2-MEB410061	2000	0.5	50	20000
8632- 2156	y	High Standard	see label	IP	7/24/2013	7/31/2013	8074-664	IV F2-MEB410060	200/100	1.0	50	4000/2000
8632- 2156	y	High Standard	see label	IP	7/24/2013	7/31/2013	8074-662	IV F2-MEB410059	200	1.0	50	4000
8632- 2156	y	High Standard	Au	IP	7/24/2013	7/31/2013	8074-357	Ricca 4112631	1000	0.1	50	2000
N/A	y	High Standard	S	N/A	N/A	N/A	8074-433	ULTRA P00037	1000	0.1	50	2000
8632- 2157	y	ICV/CCV	see label	IP	7/24/2013	7/31/2013	8074-530	SP 15-122CR	1000	0.5	50	10000
8632- 2157	y	ICV/CCV	see label	IP	7/24/2013	7/31/2013	8074-709	SP 19-029CR	100/50	1	50	2000/1000
8632- 2157	y	ICV/CCV	see label	IP	7/24/2013	7/31/2013	8074-668	SP 14-034CR	100	1	50	2000
8632- 2157	y	ICV/CCV	Au	IP	7/24/2013	7/31/2013	8074-471	FS 120437	1000	0.05	50	100
N/A	y	ICV/CCV	S	N/A	N/A	N/A	8074-469	SP 16-137S	10000	0.05	50	1000
8632- 2158	y	CRDL	see label	IP	7/24/2013	7/25/2013	8632-2120	—	various	15	30	various
8632- 2120	y	CRDL2	see label	IP	7/8/2013	7/29/2013	8074-737	see p. 652	various	2	1000	various
8632- 2047	y	ISCA	see label	IP	6/10/2013	12/10/2013	8074-772	CPI 13D009	5000/2000	20	200	500000/200000
8632- 2048	y	ISCAB	see label	IP	6/10/2013	10/15/2013	8074-772	CPI 13C018	5000/2000	20	200	500000/200000
8632- 2048	y	ISCAB	see label	IP	See Pg. 607	See Pg. 607	8632-1941	—	various	20	200	various
8632-2121	y	Tuning Solution	Mn	IP	See Pg. 666	See Pg. 666						
8632-2122	y	IS Std	Y	IP	See Pg. 666	See Pg. 666						
	DI water: 2%HNO3 / 5% HCl (lot#):			W 0133								
			Date prepared:		7/24/2013					Page 678		
						Reviewer		Date				

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ATTACHMENT A-3

ATTIC DUST LABORATORY
STANDARD OPERATING PROCEDURES

Attachment A-3
Attic Dust Laboratory SOP
Index

Laboratory	SOP Number	SOP Title	# Pages
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MSE	SP022	Processing of Attic Dust and Filter Cartridge Samples	3
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1.0 REFERENCES

1.1 EPA 530/SW-846. "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods,"Method 3050B, "Acid Digestion of Sediments, Sludges and Soils," Revision 1, Dec. 1996.

1.2 MSE Analytical Laboratory, SOP GP018, “Operation, Calibration and Maintenance of Mechanical Pipettes.”

1.3 MSE Analytical Laboratory, SOP AM008, “Determination of Percent Solids.”

2.0 SUMMARY OF METHOD

2.1 A representative sample is digested in repeated additions of nitric acid (HNO_3), hydrogen peroxide (H_2O_2), and hydrochloric acid (HCl). Samples are then filtered and analyzed for metals by ICP-OES or ICP-MS.

2.2 The diluted samples have an approximate acid concentration of 5% (v/v). A separate sample must be dried for a total % solids determination.

2.3 A separate sample must be dried for a total % solids determination.

3.0 SCOPE AND APPLICATION

3.1 Applicability of the analysis types to various elements is shown below:

ICP-MS		ICP-OES			
As	Pb	Ag	Co	Mo	V
Be	Mo	Al	Cr	Na	Zn
Cd	Se	As*	Cu	Ni	
Cr	Tl	Ba	Fe	Pb	
Co	V	Be	K	Sb	
Fe		Ca	Mg	Se*	
		Cd	Mn	Tl	

*See §10.0 of this SOP for Deviations from Method 3050B

3.2 This method is not a <u>total</u> digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become "environmentally available." By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment. If absolute total digestion is required, use Method 3052.

4.0 INTERFERENCES

Due to potential leaching of Calcium, Sodium, and Zinc from the Whatman 41 filters, all filters must be 1:1 acid washed/DI rinsed a total of 9 times.

5.0 SAFETY

5.1 Safety glasses, lab coats and latex free gloves must be worn at all times when doing these sample preparation procedures.

5.2 Sample heating must be performed under the fume hood in the sample preparation room.

5.3 Concentrated nitric acid, concentrated hydrochloric acid and 30 percent hydrogen peroxide are moderately toxic and extremely irritating to skin and mucus membranes. Use these reagents under a fume hood whenever possible and if eye or skin contact occurs, flush with large volumes of water.

5.4 30 percent hydrogen peroxide may cause a violent reaction when added to samples. Add to samples cautiously under a fume hood.

6.0 EQUIPMENT/REAGENTS

6.1 Analytical balance, with capability to measure to 0.01-g.

6.2 Analytical balance, with capability to measure to 0.0001-g.

6.3 Hot plate or hot block, capable of maintaining a temperature of 85 to 89 °C.

6.4 Drying oven – able to maintain 40 °C (if client requests samples to be air dried).

6.5 Pipetters, capable of delivering volumes ranging from 10 to 1000-uL, and associated metal free disposable pipet tips.

6.6 Whatman 41 filter paper.

6.7 Disposable plastic funnels.

6.8 125-mL Erlenmeyer flasks or 50-mL digestion tubes (one for each sample being prepped).

6.9 200-mL graduated specimen cups or 50-mL digestion tubes (one for each sample being prepped).

6.10 Reflux caps.

6.11 One-piece stem HDPE wash bottle with screw closure.

6.12 Calibrated pumps for addition of reagents.

6.13 Reagent water. All references to reagent water in this method refer to ASTM Type II grade water

6.13 Trace metals grade Nitric acid, concentrated - HNO_3

6.15 1:1 trace metals grade Nitric acid.

6.16 30% trace metals grade H_2O_2

6.17 Trace metals grade Hydrochloric acid, concentrated – HCl

6.18 Solid LCS standard for LCS/MS/MSD/MST, such as “Trace Metals in Soil” by NSI.

6.19 Plastic or metal scoops/spatula for weighing samples

6.20 Kimwipes

7.0 ANALYTICAL PROCEDURES

NOTE: Ensure that appropriate pipettes are available for sample preparation. The calibration must be performed prior to use – at least once weekly – at the setting to be used for sample preparations, and documented in the Pipette Calibration Logbook.

7.1 Standard Method-Hot Plate

7.1.1 Sample Retrieval: Samples are retrieved from the Sample Bank, and recorded in the Sample Bank Logbook as they are removed.

7.1.2 Samples to be digested must be recorded in the Solid/Mass prep book. Be sure to record the client ID, sample ID, weight of sample, weight of LCS/MS/MSD/MST standard, Q# and expiration date of LCS/MS/MSD/MST standard, final volume of digestion, analyst initials, date/time of analysis, and LIMS prep number.

7.1.3 Leach glassware with 1:10 HNO_3 for 12 hours before using for digestion. Rinse with reagent water three times before using. Label an Erlenmeyer for each sample and QA/QC sample.

7.1.4 Preparation of QA/QC Samples for each batch of 20 samples

7.1.4.1 LCS: Weigh out approximately 1.00+/-.05-g of LCS per 200-mL of final volume. Record weight to nearest 0.01-g in Solid/Mass Prep Logbook.

7.1.4.2 Matrix Spike: Weigh out approximately 1.00+/-.05-g of LCS per 200-mL of final volume. Record weight to nearest 0.01-g in Solid/Mass Prep Logbook.

7.1.4.3 Matrix Spike Duplicate: Weigh out approximately 1.00+/-.05-g of LCS per 200-mL of final volume. Record weight to nearest 0.01-g in Solid/Mass Prep Logbook.

7.1.4.4 Matrix Spike Triplicate: Weigh out approximately 1.00+/-.05-g of LCS per 200-mL of final volume. Record weight to nearest 0.01-g in Solid/Mass Prep Logbook.

7.1.4.5 Preparation Blank Unfiltered: add only reagents and do not filter on the final step of the procedure.

7.1.4.6 Preparation Blank Filtered: add only reagents and filter on the final step of the procedure.

7

NOTE: The maximum batch size is 20 samples, plus a matrix spike, matrix spike duplicate, matrix spike triplicate, LCS, prep blank unfiltered, and prep blank filtered. Usually, the first sample in the group is used for the matrix spike, matrix spike duplicate, and matrix spike triplicate unless there is insufficient sample, the sample is suspected to be a blank (i.e. pure sand), or a specific sample was requested by the client.

7.1.5 Digestion Procedure

7.1.5.1 Weigh 1.00+/-.05-g of as received sample (unless client requested analysis on air dried sample). Weigh sample to the nearest 0.01-g into a 125-mL Erlenmeyer flask. The MS/MST/MST samples will have 1.00+/-.05-g of sample plus 1.00+/-.05-g of the LCS standard. Record both weights.

NOTE: Samples digested as received must be homogenized prior to weighing. Baggies of sample should be gently massaged in the palm of your hand for about 1 minute, being sure to break up any clumps of dirt. If samples are wet, additional massaging will be necessary. Any large rocks or plant matter should be carefully removed with clean tweezers before weighing sample.

7.1.5.2 Add 5-mL of reagent water + 5-mL of concentrated HNO_3 and mix slurry, cover with a reflux cap and place on hot plate. Heat sample to 85 to 89 °C and reflux for 10 to 15 minutes without boiling.

7.1.5.3 Allow sample to cool and add 5-mL of concentrated HNO_3, replace reflux cap and return samples to hot plate and reflux for 30 minutes. Continue to add HNO_3 in 5-mL additions until no brown fumes are generated. Cool between additions.

7.1.5.4 Cool sample, add 2-mL of DI H_2O and 3-mL of 30% H_2O_2. Replace reflux cap and return to hot plate. Heat until effervescence subsides and cool the beaker.

7.1.5.5 Continue to add 30% H_2O_2 in 1-2-mL aliquots with warming until the effervescence is minimal or until the general sample appearance is unchanged. Record the amount of 30% H_2O_2 added.

NOTE: Do not add more than a total of 10-mL of 30% H_2O_2.

7.1.5.6. Cool sample, then add 10-mL concentrated HCl. Replace reflux cap and return to hot plate for an additional 15 minutes without boiling.

7.1.5.7 Cool sample, then add 2.5-mL concentrated HNO_3 and 10-mL concentrated HCl. Replace reflux cap and return to hot plate for 15 minutes without boiling.

7.1.5.8 Enter prep into the LIMS according to the Prep Entry for Solid Samples SOP. Be sure to enter the exact weight of the samples from the Solid/Mass Prep logbook. Print labels and label containers.

7.1.5.9 Pre-rinse Whatman 41 filter alternately with 1:1 HNO_3 and reagent DI H_2O nine times. After cooling, filter sample through a pre-rinsed Whatman 41 filter into a 200-mL graduated specimen cup. Rinse Erlenmeyer twice with reagent H_2O and pour rinsate through filter. Rinse filter twice with reagent H_2O and bring sample to a final volume of 200-mL with reagent DI H_2O then cap and shake sample. Be sure to filter one blank the same as above and leave one blank unfiltered.

7.1.5.10 Return prepared samples to Sample Bank and log into Sample Bank logbook.

7.2 Hot Block Procedure

7.2.1 Sample Retrieval: Samples are retrieved from the Sample Bank, and recorded in the Sample Bank Logbook as they are removed.

7.2.2 Samples to be digested must be recorded in the Solid/Mass prep book. Be sure to record the client ID, sample ID, weight of sample, weight of LCS/MS/MSD/MST standard, Q# and expiration date of LCS/MS/MSD/MST standard, final volume of digestion, analyst initials, date/time of analysis, and LIMS prep number.

7.2.3 Label a 50-mL digestion tube for each sample and QA/QC sample.

7.2.4 Preparation of QA/QC Samples for each batch of 20 samples.

7.2.4.1 LCS: Weigh out approximately 0.25+/-.003-g of LCS per 50-mL of final volume. Record weight to nearest 0.0001-g in Solid/Mass Prep Logbook.

7.2.4.2 Matrix Spike: Weigh out approximately 0.25+/-.003-g of LCS per 50-mL of final volume. Record weight to nearest 0.0001-g in Solid/Mass Prep Logbook.

7.2.4.3 Matrix Spike Duplicate: Weigh out approximately 0.25+/-.003-g of LCS per 50-mL of final volume. Record weight to nearest 0.0001-g in Solid/Mass Prep Logbook.

7.2.4.4 Matrix Spike Triplicate: Weigh out approximately 0.25+/-.003-grams of LCS per 50-mL of final volume. Record weight to nearest 0.0001-g in Solid/Mass Prep Logbook.

7.2.4.5 Preparation Blank Unfiltered: add only reagents and do not filter on the final step of the procedure.

7.2.4.6 Preparation Blank Filtered: add only reagents and must filter on the final step of the procedure.

7

NOTE: The maximum batch size is 20 samples, plus a matrix spike, matrix spike duplicate, matrix spike triplicate, LCS, prep blank unfiltered, and prep blank filtered. Usually, the first sample in the group is used for the matrix spike, matrix spike duplicate, and matrix spike triplicate unless there is insufficient sample or a specific sample was requested by the client.

7.2.5 Digestion Procedure

7.2.5.1 Weigh 0.25+/-.003-g of as received sample (unless client requested analysis on air dried sample). Weigh sample to the nearest 0.0001-g into a 50-mL digestion tube. The MS/MST/MST samples will have 0.25+/-.003-g of sample plus 0.25+/-.003-g of the LCS standard. Record both weights.

NOTE: Samples digested as received must be homogenized prior to weighing. Baggies of sample should be gently massaged in the palm of your hand for about 1 minute, being sure to break up any clumps of dirt. If samples are wet, additional massaging will be necessary. Any large rocks or plant matter should be carefully removed with clean tweezers before weighing sample.

7.2.5.2 Add 1.25-mL of reagent water + 1.25-mL of concentrated HNO_3 and mix slurry, cover with a reflux cap and place in hot block. Heat sample to 85 to 89 °C and reflux for 10 to 15 minutes without boiling.

7.2.5.3 Allow sample to cool and add 1.25-mL of concentrated HNO_3, replace reflux cap and return samples to hot block and reflux for 30 minutes. Continue to add HNO_3 in 1.25-mL additions until no brown fumes are generated. Cool between additions.

7.2.5.4 Cool sample, add 0.75-mL of DI H_2O and 0.75-mL of 30% H_2O_2. Replace reflux cap and return to hot block. Heat until effervescence subsides and cool the sample. Heating should take approximately 45 minutes.

7.2.5.5 Continue to add 30% H_2O_2 in 0.25-0.5-mL aliquots with warming until the effervescence is minimal or until the general sample appearance is unchanged. Heating should take approximately 45 minutes for each aliquot of 30% H_2O_2. Record the amount of 30% H_2O_2 added.

NOTE: Do not add more than a total of 2.5-mL of 30% H_2O_2.

7.2.5.6. Cool sample, then add 2.5-mL concentrated HCl. Replace reflux cap and return to hot block for an additional 15 minutes without boiling.

7.2.5.7 Cool sample, then add 0.625-mL concentrated HNO_3 and 2.5-mL concentrated HCl. Replace reflux cap and return to hot block for 15 minutes without boiling.

7.2.5.8 Enter prep into the LIMS according to the Prep Entry for Solid Samples SOP. Be sure to enter the exact weight of the samples from the Solid/Mass Prep logbook. Print labels and label containers.

7.2.5.9 Pre-rinse Whatman 41 filter alternately with 1:1 HNO_3 and reagent DI H_2O nine times. After cooling, filter sample through a pre-rinsed Whatman 41 filter into a 50-mL centrifuge tube. Rinse digestion tube twice with reagent H_2O and pour rinsate through filter. Rinse filter twice with reagent H_2O and bring sample to a final volume of 50-mL with reagent DI H_2O then cap and shake sample. Be sure to filter one blank the same as above and leave one blank unfiltered.

7.2.5.10 Return prepared samples to Sample Bank and log into Sample Bank logbook.

7.3 Percent Solid Determination

7.3.1 To obtain complete data, a percent solids determination must be performed.

7.3.2 This task is often performed in parallel with the digestion procedure described in this SOP. Refer to SOP AM008 for guidance.

8.0 DOCUMENTATION

8.1 Logbook L-SOIL-SOLID/MASS PREP: Sample weights must be documented in the Solid/Mass Prep Logbook.

8.2 Logbook L-GP-SBANK: Samples must be logged out of the samples bank and checked into the sample bank using the Sample Bank Logbook.

8.3 Logbook L-GP-PIPET: Pipette calibration must be recorded in the Pipette Calibration Logbook.

8.4 Sample digestions must be entered in the LIMS.

9.0 QUALITY CONTROL

9.1 Ensure that all pipettes used to measure standards and reagents are calibrated to acceptable accuracy, as described in SOP GP018.

9.2 Verify that all chemical standards used have not passed their expiration dates.

9.3 Ensure that the necessary QA/QC samples are prepared per §7.1.4 and 7.2.4 of this SOP.

9.4 QA/QC samples must be prepared at a minimum of one per batch of 20 samples.

10.0 METHOD MODIFICATION

10.1 Because of the MSE Laboratory's altitude (5,600 ft), samples are heated to a slightly lower temperature (85 to 89 °C versus the suggested 95 °C) to prevent boil-over problems.

10.2 Method 3050B does not list As or Se as a recommended element for analysis by ICP-OES. The method does state "Other elements and matrices may be analyzed by this method if performance is demonstrated for the analytes of interest, in the matrices of interest, at the concentration levels of interest." MSE Laboratory prepares and analyzes an LCS, matrix spike, matrix spike duplicate, matrix spike triplicate, and a prep blank for each batch of samples being analyzed. The review of this data will indicate if there is a problem with the analysis of As and Se using Method 3050B.

10.3 Samples digested on the hot plate are filtered into a 200-mL specimen cup or 50-mL centrifuge tube, rather than a 100-mL volumetric flask as suggested by Method 3050B, and brought to volume.

10.4 The optional addition of 2.5-mL HNO_3 and 10-mL HCl in step in §7.5 of Method 3050B is always used in order to improve the recovery of antimony, barium, lead, and silver.

10.5 When possible, MSE utilizes a 50-mL hot block for digestion, as opposed to a hot plate, in order to minimize potential contamination from glassware. All masses and volumes are adjusted accordingly, as described in this SOP.

1.0 REFERENCES

1.1 Office of Solid Waste, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846 Method 6010C, Trace Elements in Solution by Inductively Coupled Plasma-Atomic Emission Spectrometry, Revision 3, February 2007.

1.2 MSE SOP GP018, Calibrating a Pipet..

1.3 Thermo iCAP 7100ICP-OESiCAP 6000 Series ICP-OES Spectrometer User Guide, Thermo Fisher Scientific, February 2012.

1.4 MSE SOP IM001B, Operation and Maintenance of the Thermo iCAP 7400 ICP Spectrometer.

1.5 MSE SOP GP029, Standard Operating Procedure for Analyst Demonstration of Capabilities including MDL Studies, Initial Demonstration of Precision and Accuracy and the Preparation, Analysis, and Reporting of PE Study Samples.

1.6 MSE SOP SP001C-2, Acid Digestion of Waters for Total Recoverable Metals or Dissolved Metals (Modified Method 3005A) for Analysis by ICP-OES, ICP-MS, and GFAAS.

1.7 MSE Analytical Laboratory, Chemical Hygiene Plan.

1.8 Quality Assurance Plan for MSE Lab Services, MSE-111.

2.0 SUMMARY OF METHOD

2.1 The Thermo iCAP 7400 ICP-OES Duo View optical system (axial or radial views) separates element-specific wavelengths of light, emitted from the excited sample and to focus the resolved light onto the detector as efficiently as possible. The spectrometer is comprised of two sections, the fore-optics and the polychromator. When the light exits the polychromator, it is focused on to the detector

3.0 SCOPE AND APPLICATION

3.1* **This SOP is applicable to the following analytes:**

Al	**Ca**	**Mn**	**Na**
Sb	**Cr**	**Mo**	**Sr**
As	**Co**	**Ni**	**S**
Ba	**Cu**	**P**	**Tl**
Be	**Fe**	**K**	**Sn**
Bi	**Pb**	**Se**	**Ti**
		Si	
B	**Li**	**SiO_2**	**V**
Cd	**Mg**	**Ag**	**Zn**

Other elements and matrices may be analyzed by this method if performance at the concentrations of interest is demonstrated.

3.2 With the exception of dissolved water samples, all aqueous and solid matrices require acid digestion prior to analysis, unless requested otherwise by client. Samples that have been pre-filtered and acidified will not need acid digestion. Samples which are not digested require either an internal standard or should be matrix-matched with the calibration standards.

3.3 MDLs should be empirically established initially and whenever a major instrument repair is completedusing MSE SOP GP029. Analysts should clearly understand the data quality objectives prior to analysis and must document and have on file the required initial demonstration performance data described in the following sections prior to using the method for analysis.

3.4 Background correction is required for trace element determination. Background emission must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analytical line. The position used should be as free as possible from spectral interference and should reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result.

3.5 Table 1 lists the elements for which Method 6010C has been validated by the EPA. The “EPA Estimated Instrument Detection Limit” data presented in Table 1 was determined for elements in clean aqueous matrices with insignificant background interferences.

***TABLE 1: MSE LAB WAVELENGTHS AND IDLs AND EPA ESTIMATED IDLs**

Element	MSE Lab Wavelengths, nm	Recommended Wavelengths, nm(1)	MSE Lab Instrument Detection Limit, μg/L (April 2014)	EPA Estimated Instrument Detection Limit, μg/L(2)
Aluminum	308.2 206.8	308.215	18	30
Antimony		206.833	1.52	21
Arsenic	455.4	193.696	1.65	35
Barium	313.042	455.403	1.22	0.87
		313.042	0.4	0.18
Beryllium			0.098	
Boron	208.9	249.678 x 2	1.29	3.8
Cadmium	226.502 317.933	226.502	0.157	2.3
Calcium	267.716	317.933	37.8	6.7
Chromium	228.616	267.716	0.719	4.7
Cobalt		228.616	0.518	4.7
Copper	324.754 259.940	324.754	1.14	3.6
Iron	220.353	259.940	11.5	4.1
Lead		220.353	1.17	28
Lithium	279.079	670.784	1.22	2.8
Magnesium	257.610	279.079	14.4	20
Manganese		257.610	0.546	2
Molybdenum	202.030	202.030	0.798	5.3
Nickel	231.604	231.604 x 2	2.83	10
Phosphorous		213.618	2.05	51
Potassium	766.491	766.491	34.6	See (3)
Selenium	203.98	196.026	3.28	50
Silica (SiO_2)	288.158	251.611	13.7	17
Silver	328.068 588.995	328.068	0.459	4.7
Sodium		588.995	24.1	19
Strontium		407.771	0.14	0.28
Tin			1.07	17
Titanium	190.864	334.941	0.243	5.0
Thallium	292.402 213.856	190.864	1.36	27
Vanadium		292.402	0.5	5.0
Zinc		213.856 x 2	11.4	1.2

(1) The wavelengths listed (where x2 or x3 indicates second order or third order) are recommended because of their sensitivity. Other wavelengths may be substituted if they can provide the needed sensitivity and are treated with the same corrective techniques for spectral interference.
(2) These IDLs represent radial plasma data and axial plasma IDLs may be lower.
(3) Highly dependent on operating conditions and plasma position.

4.0 DEFINITIONS

4.1 Analytical Spike ("A" spike) – A post digestion spike (i.e., spike added after digestion).

4.2 Sample Batch or Sample Delivery Group (SDG) – Maximum size is 20 samples.

4.3 Calibration Blank – A volume of reagent water acidified with the same acid matrix as the calibration standards.

4.4 Calibration Standard – A series of known standard solutions used by the analyst for calibration of the instrument.

4.5 Dissolved Metals – The concentration of analyte in an aqueous sample that will pass through a 0.45-micron filter prior to sample acidification (Method 3005).

4.6 Instrument Detection Limit (IDL) – The concentration equivalent to the analyte signal which is equal to three times the standard deviation of a series of ten replicate measurements of the calibration blank.

4.7 Continuing Calibration Verification (CCV) – A solution of method analytes, used to evaluate the performance of the instrument system with respect to a defined set of criteria. Its concentration should be at or near the mid-range of the calibration curve at a frequency not to exceed every 10 samples.

4.8* Low Level CCV (LLCCV) – A solution of method analytes prepared at the same level as the reporting element for each analyte.

4.9 Initial Calibration Verification Standard (ICV) – A certified or independently prepared solution used to verify the accuracy of the initial calibration.

4.10 Linear Dynamic Range (LDR) – The concentration range over which the instrument response to an analyte is linear.

4.11 Prep Blank (PB or LRB) – A volume of reagent water processed through each sample preparation procedure.

4.12 Matrix Spike (MS) – An aliquot of an environmental sample to which known quantities of the method analytes are added. The MS/MSD samples should be spiked at the same level, and with the same spiking solution as the LCS. The MS is analyzed exactly like a sample. The MS results are compared to the results for the un-fortified sample to determine whether the sample matrix contributes bias to the analytical results.

4.13 Matrix Spike Duplicate (MSD) - A duplicate aliquot of an environmental sample to which known quantities of the method analytes are added. The MS/MSD samples should be spiked at the same level, and with the same spiking solution as the LCS. The MS and MSD results indicate precision associated with the laboratory procedures, but not with sample collection, preservation or storage procedures.

4.14 Method Detection Limit (MDL) – The minimum concentration of an analyte that can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than zero.

4.15 MDL Check Sample – A MDL check sample (standard prepared at 2-3 times the MDL) must be analyzed after the annual MDL determination and quarterly thereafter. Detection limits are verified when all analytes in the MDL check sample are detected (qualitative test).

4.17 Laboratory Control Standard (LCS) – A volume of reagent water spiked with known concentrations of analytes and carried through the preparation and analysis procedure as a sample. It is used to monitor loss/recovery values.

4.18 LDR Check Standard – A standard prepared at current established LDR levels and analyzed prior to beginning sample analysis. The LDR check standard results should be with +/- 10% recovery.

4.19 Reagent Water - All references to reagent water in this method refer to ASTM Type II grade water.

4.20 Serial Dilution (L) – A 5X dilution of the sample selected for QC analysis as it will be analyzed. For example, if Sample 1 has been chosen for the analytical spike and replicate analysis and has already been diluted 2.5X, then an additional 5X dilution (12.5X total) will be analyzed.

4.21 Spectral Interference Check Solutions (ICSA & ICSAB) – A solution of selected method analytes of higher concentrations which is used to evaluate the procedural routine for correcting known interelement spectral interferences with respect to a defined set of method criteria.

4.22 Total Metals – The concentration of analyte determined in a sample following digestion by Methods 3010, 3015, 3020, 3051, or 3052.

5.0 SAFETY

5.1 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound should be treated as a potential health hazard. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of material handling data sheets should be made available to all personnel involved in the chemical analysis.

5.2 The acidification of samples containing reactive materials may result in the release of toxic gases, such as cyanides or sulfides. Acidification of samples must be performed in a fume hood.

5.3 The inductively coupled plasma should only be viewed with proper eye protection from the UV emissions.

5.4 Concentrated hydrochloric acid and concentrated nitric acid are moderately toxic and extremely irritating to skin and mucous membranes. Use these reagents with safety glasses and gloves at all times and in a hood whenever possible. If eye or skin contact occurs, flush with large volumes of water. Seek medical attention if necessary.5.5 Hydrofluoric acid is a very toxic acid and penetrates the skin an tissues deeply if not treated immediately. Boric acid and other complexing reagents and appropriate treatment agents should be administered immediately. Consult appropriate safety literature and have appropriate treatment materials readily available prior to working with this acid. Calcium gluconate is available in the lab for treatment of hydrofluoric acid burns.

6.0 INTERFERENCES

Several types of interference effects may contribute to inaccuracies in the determination of trace elements. They may be summarized as follows:

Spectral interferences can be categorized as 1) overlap of a spectral line from another element; 2) unresolved overlap of molecular band spectra; 3) background contribution from continuous or recombination phenomena; and 4) background contribution from stray light from the line emission of high concentration elements. The first of these effects can be compensated by utilizing a computer correction of the raw data, requiring the monitoring and measurement of the interfering element. The second effect may require selection of an alternate wavelength. The third and fourth effects can usually be compensated by a background correction adjacent to the analyte line. In addition, users of simultaneous multi-element instrumentation must assume the responsibility of verifying the absence of spectral interference from an element that could occur in a sample for which there is no channel in the instrument array.

Listed in Table 2 are some interference effects of the recommended wavelengths given in Table 1. The data in Table 2 are intended for use only as a rudimentary guide for the indication of potential spectral interferences. For this purpose, linear relations between concentration and intensity for the analytes and the interferents can be assumed. The interference information, which was collected at the Ames Laboratory, is expressed as analyte concentration equivalents (i.e., false analyte concentrations) arising from 100-mg/L of the interfering element.

Physical interferences are generally considered to be effects associated with the sample nebulization and transport process. Such properties as change in viscosity and surface tension can cause significant inaccuracies, especially in samples which may contain high dissolved solids and/or acid concentrations. The use of a peristaltic pump may lessen these interferences. If these types of interferences are operative, they must be reduced by dilution of the sample and/or utilization of standard addition techniques. Another problem which can occur from high dissolved solids is buildup at the tip of the nebulizer. This affects aerosol flow rate causing instrumental drift. Wetting the argon prior to nebulization or sample dilution have been used to control this problem. Also, it has been reported that better control of the argon flow rate improves instrument performance. This is accomplished by the use of mass flow controllers.

Chemical interferences are characterized by molecular compound formation, ionization effects and solute vaporization effects. Normally these effects are not pronounced with the ICP technique, however, if observed they can be minimized by careful selection of operating conditions (that is, incident power, observation position, and so forth), by buffering of the sample, by matrix matching, by the method of standard addition procedures, and/or the use of internal standards. These types of interferences can be highly dependent on matrix type and the specific analyte element.

If the analyte concentration is sufficiently high (minimally a factor of 50 above the method detection limit in the original sample), the serial dilution (a five fold dilution) must then agree within 10% of the original determination after correction for dilution. If the dilution analysis for one or more analytes is not within 10%, a chemical or physical interference effect must be suspected.

TABLE 2: EXAMPLE OF ANALYTE CONCENTRATION EQUIVALENTS (mg/L) ARISING FROM INTERFERANTS AT THE 100 mg/L LEVEL

Analyte	Wavelength, nm	Interferant									
		Al	Ca	Cr	Cu	Fe	Mg	Mn	NI	Ti	V
Aluminum	308.215	--	--	--	--	--	--	0.21	--	--	1.4
Antimony	206.833	0.47	--	2.9	--	0.08	--	--	--	0.25	0.45
Arsenic	193.696	1.3	--	0.44	--	--	--	--	--	--	1.1
Barium	455.403	--	--	--	--	--	--	--	--	--	--
Beryllium	313.042	--	--	--	--	--	--	--	--	0.04	0.05
Boron	249.773	4.04	--	--	--	0.32	--	--	--	--	--
Cadmium	226.502	--	--	--	--	0.03	--	--	0.02	--	--
Calcium	317.933	--	--	0.08	--	0.01	0.01	0.04	--	0.03	0.03
Chromium	267.716	--	--	--	--	0.003	--	0.04	--	--	0.04
Cobalt	228.616	--	--	0.03	--	0.005	--	--	0.03	0.15	--
Copper	324.754	--	--	--	--	0.003	--	--	--	0.05	0.02
Iron	259.940	--	--	--	--	--	--	0.12	--	--	--
Lead	220.353	0.17	--	--	--	--	--	--	--	--	--
Magnesium	279.079	--	0.02	0.11	--	0.13	--	0.25	--	0.07	0.12
Manganese	257.610	0.005	--	0.01	--	0.002	0.002	--	--	--	--
Molybdenum	202.030	0.05	--	--	--	0.03	--	--	--	--	--
Nickel	231.604	--	--	--	--	--	--	--	--	--	--
Selenium	196.026	0.23	--	--	--	0.09	--	--	--	--	--
Silicon	288.158	--	--	0.07	--	--	--	--	--	--	0.01
Sodium	588.995	--	--	--	--	--	--	--	--	0.8	--
Thallium	190.864	0.03	--	--	--	--	--	--	--	--	--
Vanadium	292.402	--	--	0.05	--	0.005	--	--	--	0.02	--
Zinc	213.856	--	--	--	0.14	--	--	--	0.29	--	--

TABLE 3: INTERFERANT AND ANALYTE CONCENTRATIONS USED FOR INTERFERENCE MEASUREMENTS IN TABLE 2

Analyte	(mg/L)	Interferents	(mg/L)
Al	10	Al	1000
As	10	Ca	1000
B	10	Cr	200
Ba	1	Cu	200
Be	1	Fe	1000
Ca	1	Mg	1000
Cd	10	Mn	200
Co	1	Ni	200
Cr	1	Ti	200
Cu	1	V	200
Fe	1		
Mg	1		
Mn	1		
Mo	10		
Na	10		
Ni	10		
Pb	10		
Sb	10		
Se	10		
Si	1		
Tl	10		
V	1		
Zn	10		

7.0 APPARATUS

7.1 Thermo iCAP 7100 ICP-OES (computer controlled emission spectrometer with background correcting capability).

7.2* **Solid state radio frequency generator.**

7.3 Argon gas supply.

7.4 Pipettes, capable of delivering volumes ranging from 10 to 1000 uL, and associated metal free disposable pipet tips.

7.5 Glassware - Class A volumetric flasks, graduated cylinders and funnels (glass and/or metal free plastic).

7.6 50-mL graduated centrifuge tubes.

7.7 15-mL graduated centrifuge tubes.

8.0 REAGENTS AND STANDARDS

Reagents may contain elemental impurities, which might affect analytical data. Reagent grade reagents that conform to the American Chemical Society (ACS) specification should be used. If the purity of a reagent is in question, analyze for contamination.

8.1 Reagent water. All references to reagent water in this method refer to ASTM Type II grade water.

8.2 Hydrochloric acid, reagent grade, concentrated (sp.gr. 1.19) – HCl.

8.3 Nitric acid, reagent grade, concentrated (sp.gr. 1.41) – HNO_3.

8.4 Hydrogen peroxide, H_2O_2, 30% (screened for impurities).

8.5 Standard stock solutions can be purchased from a commercial supplier such as CPI, Spex, QCD, or CertiPrep.

8.6* **Calibration Blank (2.5% HNO_3, 5% HCl, 0.75% H_2O_2) - To a 4-L container, add 100-mL con. HNO_3, 200-mL con. HCl, and 30-mL 30% H_2O_2.**

8.7* **Continuing Calibration Verification (CCV) – The CCV solution is used to periodically check instrument performance during analysis. The CCV should be prepared from the same standard stock solutions as the calibration standards, but does not need to be prepared from the same standards.**

1 mg/L Ag
5 mg/L Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sr, Tl, Ti, V, Zn, Ba, B, Bi, Sn
10 mg/L Al, Na, K, Si, P, S, Ca, Mg

8.8* **Low Level CCV (LLCCV) – Analysis of a LLCCV is required for initial verification of calibration standards in order to verify instrument performance. The LLCCV is a prepared standard and contains metals at the following concentrations:**

0.020 mg/L Ag
0.050 mg/L Ba, Be, Cd, Li, Mn, Sr
0.100 mg/L Co, Cr, Cu, Fe, Mo, Ni, Ti, V, Zn
0.200 mg/L As, B, Bi, Ca, S, Sb, Se, Sn, Tl
0.250 mg/L Al, Pb
0.500 mg/L K, Mg, Na, P, Si

8.9* **Initial Calibration Verification (ICV) – Analysis of an ICV is required for initial verification of calibration standards in order to verify instrument performance. The ICV must be obtained from an outside source different from the calibration standards and must be prepped in the same matrix as the calibration standards, at or near the mid-range of the calibration curve. The ICV is prepared on an as needed basis.**

0.200 mg/L Ag
1.00 mg/L Ba, B, Bi, Sn, Sb, As, Be, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Mo, Ni, Se, Sr, Tl, Ti, V, Zn,
2.00 mg/L Ca, Mg, Si, P, S, K, Na, Al

8.10 Spectral Interference Check Solutions (ICSA/ICSAB) – When interelement corrections are applied, SIC solutions are needed containing concentrations of the interfering elements at levels that will provide an adequate test of correction factors.

ICSA
200 mg/L Fe
500 mg/L Al, Ca, Mg

ICSAB
0.50 mg/L Ba, Co, Cu, Mn, V
1.0 mg/L Ag, Cr, Ni, Pb, Mo, Sb, Se, Sn, Sr, Ti, Tl, Be, Li, B, Cd, Zn, As, Bi
10.0 mg/L P, Si, K, Na, S
200 mg/L Fe
500 mg/L Al, Ca, Mg

8.11 LDR Check Standard – changes annually, so current LDR's and prep standards at those levels.

8.12 Plasma Solution – The plasma solution is used for determining the optimum viewing height of the plasma above the work coil.

1 mg/L Y in 5% HNO_3 and 2.5% HCl.

9.0 QUALITY CONTROL

Refer to Appendix A for specific QC requirements.

9.1 A prepared batch can consist of no more than 20 samples.

9.2 Initial Calibration Verification (ICV) – Analyze after initial calibration. Prepare from an independent source at or near the midpoint of the calibration. Criteria: +/- 10% of the true value.

9.3* Initial Calibration Blank (ICB): Analyze after the ICV. Criteria: <RL.

9.4 Continuing Calibration Verification (CCV) – Analyze after the ICV, at the end of the batch and every 10 samples. Criteria: +/- 10% of the true value.

9.5* Continuing Calibration Blank (CCB) – Analyze after the CCV. Criteria: <RL.

9.6 Low Level CCV (LLCCV) – Same as a Reporting Limit Check Standard. Analyze initially, every 10 samples, and at the end of the run. Prepared from the same standards as the calibration standards at the same levels as the reporting limit. Criteria: +/- 30% of the true value. If the LLCCV fails to meet +/- 30% recovery, evaluate the concentration of the samples in the batch to determine if re-analysis is necessary.

9.7* Prep Blank (PB or LRB) – The laboratory must prepare one per batch. Criteria: <RL.

9.8 Laboratory Control Sample (LCS) – The laboratory must prepare one per batch. Criteria: +/- 20% of the analyte true value. The LCS is prepared at the same concentration as the MS and MSD.

9.9 Matrix Spike (MS) – The laboratory must prepare one for every 10 samples. Criteria: +/- 25% spike recovery.

9.10* Matrix Spike Duplicate (MSD) – The laboratory must prepare one per batch. Criteria: +/- 25% spike recovery and < 20% RPD with the MS.

9.12* **Serial Dilution (L) – Analyze if the Analytical Spike recoveries are unacceptable. Criteria: +/- 10% of the original sample concentration. The serial dilution is not applicable if the analyte concentration in the undiluted sample is less than 10*RL.**

9.11* **Analytical Spike (A) – Analyze if the MS/MSD recoveries are unacceptable. Criteria: +/- 20% spike recovery. The spike addition should produce a minimum of 10 times and a maximum of 100 times the lower Reporting Limit.**

9.13 LLQC Low Level Quantitation Check – Prepared at the same level as the LLCCV, but carried through the entire preparation and analytical procedure.

10.0 SAMPLE HANDLING AND PRESERVATION

Samples are received at the MSE Lab by the Sample Receiving Team. Preservation and pretreatment of samples are verified against the chain-of-custody form and analytical request as follows:

10.1 Dissolved Analyte Samples: The samples must be filtered through a 0.45-um pore diameter membrane filter at the time of collection or as soon thereafter as practically possible. The laboratory must perform filtration immediately if the step was not performed in the field. Acidify the filtrate with (1+1) nitric acid immediately following filtration to pH<2 (normally, 3 mL of (1+1) nitric acid per liter of sample is sufficient for ambient and drinking water samples).

10.2 Aqueous Total Recoverable Analyte Samples: Samples are preserved by acidifying with (1+1) nitric acid to pH<2 (normally, 3 mL of (1+1) nitric acid per liter of sample is sufficient for ambient and drinking water samples). Preservation may be done at the time of collection. However, to avoid the hazards of strong acids in the field, transport restrictions and possible contamination, samples may be shipped to the laboratory within two weeks of collection and preserved upon receipt in the laboratory. The technical holding time for properly preserved samples is six months.

10.3 Solid Samples: Solid samples require no preservation prior to analysis other than storage at < 6 ºC. There is no established holding time limitation for solid samples.

11.0 ANALYTICAL PROCEDURES-AQUEOUS SAMPLES

11.1 Sample Preparation
Prior to analysis, samples must be solubilized or digested using the appropriate sample preparation methods. When analyzing groundwater samples for dissolved constituents, acid digestion is ***not*** necessary if the samples are filtered and acid preserved prior to analysis

11.1.1 Aqueous Samples, Dissolved Analytes - For the determination of dissolved analytes in ground and surface waters, pipet a 20-mL aliquot of the filtered, acid preserved sample into a 50-mL polypropylene centrifuge tube. Add 0.40mL (1+1) nitric acid to adjust the acid concentration to 1% (v/v). The sample is now ready for analysis. Note: If a precipitate is formed during acidification, transport, or storage, the sample aliquot must be digested using the procedure in §11.1.3 prior to analysis.

11.1.2 Total Recoverable Analytes, Direct Analysis - Groundwater samples that have been pre-filtered and acidified will not need acid digestion.

11.1.3 Total Metals – Digest samples according to MSE SOP SP001C – Acid Digestion of Waters for Total Recoverable and Dissolved Metals (Modified Method 3005A). The sample is now ready for analysis.

11.2 Optimization (Performed daily, prior to analysis)

11.2.1 Ignite the plasma.

11.2.2 Allow the instrument to become thermally stable (approximately 30-60 minutes).

11.2.3* Before daily calibration and after the instrument warm-up period, check the nebulizer gas flow to determine optimum flow: (refer to MSE SOP IM001B, Operations and Maintenance Thermo iCAP 7400 ICP-OES Section 11.2, Routine Menu, plasma optimization).

11.2.4 Optimize the system by aspirating a solution containing 10 µg/L of As, Se, Tl, and Pb. (Other elements - V, Cr, Cu, Li and Mn – may also be used.) Collect intensity data at the wavelength peak for each analyte at 1 mm intervals from 14 to 18 mm above the load coil. Repeat the process using the calibration blank. Determine the net signal to blank intensity ratio for each analyte for each viewing height setting. Choose the height for viewing the plasma that provides the best net intensity ratios for the elements analyzed or the highest intensity ratio for the least sensitive element.

11.3 Sample Analysis

11.3.1 Record all analytical runs in the appropriate log book (see §14). Refer to MSE SOP IM001B (Operation and Maintenance of the Thermo iCAP 7400 ICP-OES) for detailed operating instructions.

11.3.2 Set-up and configure the instrument and data system.

11.3.3 Optimize the instrument.

11.3.3 Start analysis sequence and analyze samples (see Table 4 for an example analytical run sequence).

***TABLE 4: EXAMPLE ANALYTICAL RUN SEQUENCE**

Sample Sequence	Description
Cal Blank	
Cal Stds	
1	ICV Thermo****
2	ICB Thermo****
3	CCV Thermo****
4	LLCCV Thermo****
5	CCB Thermo****
6	ICSA Thermo****
7	ICSAB Thermo****
8	PB
9	LLQC
10	LCS
11	S1
12	MS
13	S1 MSD
14	S2
15	CCV Thermo****
16	LLCCV Thermo****
17	CCB Thermo****
18	S3
19	S4
20	S3
21	S5
22	S6
23	S7
24	S8
25	S9
26	S10
28	ICSA Thermo****
29	ICSAB Thermo****
30	CCV Thermo****
31	LLCCV Thermo****
32	CCB Thermo****
Note: Thermo**** denotes the Thermo Standard number assigned to that standard (see B-IM-7400ICPSTD logbook for appropriate standard numbers).	

11.3.4 Review results for QC compliance and off-scale results (see Appendix A for method-specific QC criteria). Identify samples which must be re-analyzed in a different analytical run. Samples having analytes at concentrations higher than the linear dynamic range must be diluted into range and re-analyzed.

11.3.5 The iTeva software can be automatically programmed to shut down the instrument at the end of the run.

12.0 DATA REDUCTION AND REPORTING

12.1 All results should be reported with up to three significant figures.

12.2 Sample data should be reported in mg/L.

12.3 If dilutions were performed, the appropriate factors must be applied to sample values.

12.4 Do not report analyte concentrations below the method detection limit.

13.0 DOCUMENTATION

13.1 L-IM-7400ICPRUN: Analysis Run Logbook for the Thermo iCAP 7400 ICP-OES.

13.2 L-IM-ARLMAINT: Maintenance Logbook for the Thermo iCAP 7400 ICP-OES.

13.3 B-IM-7400ICPSTD: Standard Preparation Logbook for Thermo iCAP 7400ICP-OES.

14.0 DEVIATIONS FROM REFERENCED METHOD

14.2 A complete MDL study is performed initially by each analyst followed by quarterly MDL checks. A complete MDL study is performed after any major instrument repair or part replacement.

14.3 Method 6010C suggests preparing the CCV from the calibration standards; however, MSE Lab prepares the CCV from an independent standard.

14.4 Sections 10.3.3 and 10.3.4 of SW846 Method 6010C, Rev 3, February 2007 refer to LLCCV's and LLICV's, which are both defined as a standard "prepared using the same source as the calibration standards, at a concentration expected to be the lower limit of quantitation". Both standards have acceptance criteria of +/- 30% recovery. The LLICV is analyzed at the beginning of the run while the LLCCV is analyzed at the beginning, end, and every 10 samples throughout the run. MSE will utilize the LLCCV to represent both of these standards in our ongoing goal of minimizing waste in the laboratory.

*APPENDIX A — QA /CONTROL LIMITS FOR ICP-OES — SW846 Method 6010C

Parameter (1)	Frequency	Acceptance Criteria/Comments	Corrective Action
Laboratory Control Sample (LCS)	1/SDG	80-120% for water Manufacturer's limits for soil	Re-run once, if still out re-digest/reanalyze all samples associated with LCS.
Low Level QC (LLQC)	1/SDG	**70-130%**	LLCCV standard that is carried through prep. Evaluate sample concentrations if LLQC doesn't meet criteria.
Preparation Blank (PB)	1/SDG	**<RL**	If the method blank does not contain target analytes at a level that interferes with the project-specific DQOs, then the method blank would be considered acceptable. Re-digest/reanalyze all samples associated with PB.
Laboratory Matrix Spike (MS)	1/SDG	75-125% R N/A if sample conc. > 4*spike conc.	Check "A" spike and serial dilution results. Flag/qualify samples as appropriate.
Matrix Spike Duplicate (MSD)		≤ 20% RPD 75- 125% R for spike	Check "A" spike and serial dilution results. Flag/qualify samples as appropriate.
Instrument Calibration Verification (ICV)	After each calibration	90-110% R; RSD≤ 5%	Recalibrate instrument.
Initial Calibration Blank (ICB)	After ICV	**<RL**	Recalibrate instrument
Low Level Continuing Calibration Verification (LLCCV)	Beg/End, every 10 samples	70-130% R	Recalibrate instrument.
Continuing Calibration Verification (CCV)	1/10 samples	90-110% R, RSD≤5%	Recalibrate instrument and re-run all samples since last compliant CCV.
MDL Check	Quarterly	All analytes must be detectable.	Perform MDL study until all analytes are detectable.
Continuing Calibration Blank (CCB)	1/10 samples (after each CCV)	**<RL**	Recalibrate instrument and re-run all samples since last compliant CCB.
Interference Check Solution A (ICSA)	Beg/End, every 20 samples	**<RL** **< 0.1 mg/L Na, K, Si**	Recalibrate instrument, re-run samples.
Interference Check Solution B (ICSAB)	Beg/End, every 20 samples	80-120% R	Recalibrate instrument and re-run all samples since last compliant interference check.
Analytical Spike (A)	1/SDG	80-120% R	Analyze serial dilution. Flag data.
Serial Dilution (L)	1/SDG	**+/- 10% of original conc.** **N/A if conc. < 10*RL**	Only applies if MS, MSD, A-Spike fail. Flag/qualify samples as appropriate.
INSTRUMENT CALIBRATION REQUIREMENT: Minimum of a blank and one standard.			
NOTES: SDG = Sample Delivery Group (maximum size = 20 samples). %R denotes percent recovery.			

1.0 REFERENCES

1.1 ASTM D422. "Standard Test Method for Particle-Size Analysis of Soils," Reapproved 1990.MSE Analytical Laboratory, SOP AM022, "Dry and Wet Sieve Analysis - ASTM D422 (Soils), ASTM C602 (Lime)."

2.0 SUMMARY OF METHOD

2.1 The total weight of attic dust samples is recorded, the samples are sieved to <18 mesh, and a post sieve weight is recorded. The samples are then ready for digestion and analysis of metals.

2.2 Filter cartridge samples are opened and a total weight is recorded. The samples are then ready for digestion and analysis of metals.

3.0 SCOPE AND APPLICATION

This SOP refers to the processing of Attic Dust and Filter Cartridge samples in order to prepare them for digestion and analysis of metals.

4.0 INTERFERENCES

Sieves must be thoroughly cleaned between samples to ensure there is no carryover of contaminants from one sample to the next.

5.0 SAFETY

5.1 Safety glasses, lab coats and latex free gloves must be worn at all times when doing these sample preparation procedures.

5.2 Sample sieving must be performed in the fume hood in the soils laboratory.

5.3 Attic dust samples may contain elevated levels of contaminants, including, but not limited to, arsenic and lead. Care must be taken to minimize exposure to these contaminants.

6.0 EQUIPMENT/REAGENTS

6.1 Analytical balance, with capability to measure to 0.0001-g.

6.2 Analytical balance, with capability to measure to 0.01-g.

6.3 18 mesh mini sieve and mini sieve pan.

6.4 Tool for opening filter cartridge, if they are not screw-open style.

6.5 Digestion container (either 50-mL digestion tube or 125-mL Erlenmeyer flask).

6.6 Tweezers.

6.7 Deionized water.

6.8 Kimwipes.

6.9 Air Compressor.

7.0 ANALYTICAL PROCEDURES

7.1 Processing of Dust Samples

7.1.1 Sample Retrieval: Samples are retrieved from the Sample Bank, and recorded in the Sample Bank Logbook as they are removed.

7.1.2 Record the total weight of the attic dust sample to the nearest 0.0001-g in the miscellaneous wet chemistry logbook.

7.1.3 Sieve entire sample through an 18 mesh mini-sieve and record the post sieve weight to the nearest 0.0001-g in the miscellaneous wet chemistry logbook.

7.1.4 Sieves must be thoroughly cleaned with compressed air between each sample.

7.1.5 Samples are ready for digestion per SP001E or SP001K.

7.2 Processing of Filter Cartridge Samples

Note: The procedure for determining the exact weight of sample collected on the filter will depend on the type of cartridge used for collection. Some filter cartridges will come with a filter weight or a blank filter to weigh for correction. If not, a blank filter must be provided, or the entire cartridge must be weighed prior to use and prior to opening.

7.2.1 Sample Retrieval: Samples are retrieved from the Sample Bank, and recorded in the Sample Bank Logbook as they are removed.

7.2.2 Label a digestion container for each sample.

7.2.3 Open the filter cartridge and place the entire filter and associated sample in a tared digestion container. Record the weight to the nearest 0.0001-g in the miscellaneous wet chemistry book.

7.2.3.1 In order to determine the weight of the sample, the weight of the filter must be subtracted. This can be determined by subtracting the weight of filter from an unused filter cartridge, or subtracting the known weight from pre-weighed filter cartridges. The corrected weights must be recorded in the Sample/Mass Prep logbook.

7.2.4 Samples are ready for digestion per SP001E or SP001K.

8.0 DOCUMENTATION

8.1 Logbook L-GP-SBANK: Samples must be logged out of the samples bank and checked into the sample bank using the Sample Bank Logbook.

8.2 Logbook L-WC-MISC: Sample weights for Attic Dust and Filter Cartridge samples must be recorded in the Miscellaneous Wet Chemistry Logbook.

8.3 Logbook L-SOIL-SOLID/MASS PREP: Corrected sample weights for Filter Cartridge Samples must be documented in the Solid/Mass Prep Logbook.

8.4 Post sieve weights must be entered into the LIMS.

9.0 QUALITY CONTROL

9.1 Ensure that all sieves are cleaned appropriately between samples using an air compressor.

9.2 No QA/QC samples are performed during the processing of Attic Dust or Filter Cartridge samples since the entire sample is consumed. Appropriate QA/QC samples will be performed during the sample digestion.

10.0 METHOD MODIFICATION

There are no modifications to the method.

1.0 REFERENCES

1.1 ASTM E 1644. "Standard Practice for Hot Plate Digestion of Dust Wipe Samples for the Determination of Lead," 1998.

1.2 MSE Analytical Laboratory, SOP GP018, "Operation, Calibration and Maintenance of Mechanical Pipettes."

1.3 ASTM E 1792-96a. "Standard Specification for Wipe Sampling Materials for Lead in Surface Dust," 1996.

2.0 SUMMARY OF METHOD

2.1 Dust wipe samples are digested on a hot plate with the addition of nitric acid and hydrogen peroxide. The digestate is analyzed for Lead, or other required analytes.

2.2 Wipes can be any disposable, porous paper towelette that is moistened with a wetting agent. Wipes should not contain the analytes of interest, must be of single thickness, must be durable and not tear easily, must not contain aloe, can be digested in the laboratory, have been shown to yield 80-120% recovery rates from spiked samples, and must remain moist during sampling.

3.0 SCOPE AND APPLICATION

3.1 This SOP refers to the digestion of dust wipe samples for the analysis of total recoverable metals. The procedure is specifically designed for the analysis of Lead, but other analytes can be determined with the appropriate QA/QC to show that the procedure is accurate.

3.2 This method is not a total digestion technique. By design, elements bound in silicate structures are not normally dissolved by this procedure.

4.0 INTERFERENCES

A blank wipe must be provided for digestion to ensure that there is no background of the analytes of interest present in the wipe.

5.0 SAFETY

5.1 Safety glasses, lab coats and latex free gloves must be worn at all times when doing these sample preparation procedures.

5.2 Sample heating must be performed under the fume hood in the sample preparation room.

5.3 Concentrated nitric acid, concentrated hydrochloric acid and 30 percent hydrogen peroxide are moderately toxic and extremely irritating to skin and mucus membranes. Use these reagents under a fume hood whenever possible and if eye or skin contact occurs, flush with large volumes of water.

5.4 30 percent hydrogen peroxide may cause a violent reaction when added to samples. Add to samples cautiously under a fume hood.

6.0 EQUIPMENT/REAGENTS

6.1 Analytical balance, with capability to measure to 0.0001-g.

6.2 Hot plate, variable temperature, capable of maintaining a temperature of 85 to 89 °C.

6.3 Pipetters, capable of delivering volumes ranging from 10 to 1000-uL, and associated metal free disposable pipet tips.

6.4 250-mL beakers.

6.5 Watchglasses.

6.6 200-mL graduated specimen cups.

6.7 Tweezers.

6.8 Glass Rods.

6.9 Reagent water. All references to reagent water in this method refer to ASTM Type II grade water.

6.10 Kimwipes

6.11 Disposable Plastic Funnels

6.12 Whatman 41 Filter paper

6.13 Trace metals grade Nitric acid, concentrated - HNO_3

6.14 30% trace metals grade H_2O_2

6.15 Solid LCS standard for LCS/MS/MSD/MST, such as “Trace Metals in Soil” by NSI.

6.16 One-piece stem HDPE wash bottle with screw closure.

6.17 1:10 Nitric acid for glassware leaching.

6.18 Plastic or metal scoops/spatula.

6.19 Calibrated pumps for addition of reagents.

6.20 Liquid spike standard for addition to blank wipe (must contain all analytes of interest).

7.0 ANALYTICAL PROCEDURES

NOTE: Ensure that appropriate pipettes are available for sample preparation. The calibration must be performed prior to use – at least once weekly – at the setting to be used for sample preparations, and documented in the Pipette Calibration Logbook.

7.1 All 250-mL beakers to be used for digestion must leach over night in 1:10 Nitric acid solution. Beakers are then rinsed 3 times with DI water.

7.2 Sample Retrieval: Samples are retrieved from the Sample Bank, and recorded in the Sample Bank Logbook as they are removed.

7.3 Preparation of QA/QC Samples for each batch of 20 samples

NOTE: A minimum of 3 blank wipes will be required from the client for QA/QC purposes.

7.3.1 LCS: Add 0.2-mL of 1000-ug/L Lead standard to the initial reagents in §7.5.

7.3.2 Matrix Spike: Place blank wipe into labeled beaker. Spike with 0.2-mL of 1000-ug/L Lead standard.

7.3.3 Matrix Spike Duplicate: Place blank wipe into labeled beaker. Spike with 0.2-mL of 1000-ug/L Lead standard (or other requested analyte).

7.3.4 Preparation Blank Wipe: add blank filter and all reagents and must filter on the final step of the procedure.

7.3.5 Preparation Blank Unfiltered: add only reagents and do not filter on the final step of the procedure.

7.3.6 Preparation Blank Filtered: add only reagents and must filter on the final step of the procedure.

7.4 Transfer entire contents of sample into labeled beaker using a new pair of gloves for each sample.

7.4.1 If sample was in a centrifuge tube, rinse tube with 2 small aliquots of DI water into beaker with sample.

7.4.2 If sample was in a plastic bag, attempt to remove any remaining sample with shaking or a clean spatula. Be sure to note if there is any sample remaining in the bag.

7.5 Add 12.5-mL concentrated Nitric acid and 12.5-mL DI water to beaker. Cover beaker with watchglass and gently heat at a temperature of 85-89^{O}C for 15 minutes without boiling. Using a glass rod, occasionally push the wipe down into the digestion solution.

7.6 Remove beaker from heat and allow sample to cool to room temperature.

7.7 Add 10-mL concentrated nitric acid, replace watch glass, and reflux for 30 minutes.

7.8 Remove watch glass from sample and continue heating until volume is reduced to 10-mL. Do not allow sample to boil.

7.9 Remove sample from heat and allow sample to cool to room temperature.

7.10 Add 5-mL DI water and 5-mL 30% hydrogen peroxide. Cover sample with watchglass and return to hot plate. Heat until effervescence subsides.

7.11 Remove sample from heat and allow sample to cool to room temperature.

7.12 Remove watchglass and return sample to hot plate. Heat until volume is reduced to 10-mL.

7.13 Remove sample from heat and allow sample to cool to room temperature.

7.14 Rinse the bottom of the watchglass with DI water into the beaker.

7.15 Enter prep into the LIMS according to the Prep Entry for Solid Samples SOP. Be sure to enter the exact weight of the samples from the Solid/Mass Prep logbook. Print labels and label containers.

7.15 Filter digestate through a Whatman 41 filter into a labeled 200-mL specimen cup. Rinse the walls of the beaker 2 times with DI water into the filter. Rinse the filter 2 times with DI water. Bring sample to final volume of 100-mL with DI water.

8.0 DOCUMENTATION

8.1 Logbook L-GP-SBANK: Samples must be logged out of the samples bank and checked into the sample bank using the Sample Bank Logbook.

8.2 Logbook L-SOIL-SOLID/MASS PREP: Weight of the LCS must be documented in the Solid/Mass Prep Logbook.

8.3 Post sieve weights must be entered into the LIMS.

8.4 Sample digestions must be entered in the LIMS.

9.0 QUALITY CONTROL

9.1 Ensure that all pipettes used to measure standards and reagents are calibrated to acceptable accuracy, as described in SOP GP018.

9.2 Verify that all chemical standards used have not passed their expiration dates.

9.3 Ensure that the necessary QA/QC samples are prepared per §7.3 of this SOP.

9.4 QA/QC samples must be prepared at a minimum of one per batch of 20 samples

9.5 Report final results in ug/wipe.

10.0 METHOD MODIFICATION

10.1 Because of the MSE Laboratory's altitude (5,600 ft msl), samples are heated to a slightly lower temperature (85 to 89 °C versus the suggested 85-100 °C) to prevent boil-over problems.

10.2 ASTM method 1644 is specific to the digestion of wipes for Lead analysis. MSE Laboratory prepares and analyzes an LCS, matrix spike, matrix spike duplicate, and a preparation wipe blank for each batch of samples being analyzed. The review of this data will indicate if there is a problem with the analysis of other analytes using this digestion.

ATTACHMENT B

TECHNICAL MEMORANDA

Attachment B-1:	**Technical Memorandum #2 – Modifying the Sample Depth Intervals Used to Make Remedial Decisions for Arsenic and Lead in Yard Soils**
Attachment B-2:	**Technical Memorandum #1 – Basis for Excluding Living Space Dust and Addressing Only Accessible Attic Dust through Analysis of the Existing Data**
Attachment B-3:	**Agency Approval Letter for Technical Memoranda #1 and #2**

ATTACHMENT B-1

TECHNICAL MEMORANDUM #2
MODIFYING THE SAMPLE DEPTH INTERVALS USED TO MAKE REMEDIAL DECISIONS FOR ARSENIC AND LEAD IN YARD SOILS

ANACONDA COMMUNITY SOILS REMEDIAL ACTION WORK PLAN TECHNICAL MEMORANDUM #2 – MODIFYING THE SAMPLE DEPTH INTERVALS USED TO MAKE REMEDIAL DECISIONS FOR ARSENIC AND LEAD IN YARD SOILS

Background and Purpose

In 2002 the *Final Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* and the Sampling and Analysis Plan attached to the RAWP/FDR specified surface samples (0-2 inch depth) to be collected along with 2-6 and 6-12 inch depth samples (if the 0-2 weighted average exceeded the action level) with Remedial Action (RA) performed to the depth of the exceedance or to 18 inches if the 6-12 inch interval exceeded the action level. These sampling depths were developed to meet the arsenic cleanup requirements specified in the 1996 Community Soils Operable Unit (CSOU) Record of Decision (ROD). In 2013 EPA released an amendment to the 1996 CSOU ROD which did not specify any changes to these depth intervals for arsenic sampling/remediation, but specified that the requirements of the *Superfund Lead-Contaminated Residential Sites Handbook* (EPA 2003) should be followed for lead. The 2013 amendment provided a discontinuity in the methods for sampling arsenic (As) and lead (Pb) in soils. On March 27, 2014 Atlantic Richfield (AR) submitted an outline of the proposed CSOU Remedial Action Work Plan (RAWP) and the CSOU Residential Soils and Interior Dust Sampling and Analysis Plan (SAP) for implementing the work required under the ROD amendment to EPA and DEQ (the Agencies). Two issues concerning differences in proposed sampling depth intervals between the 2014 RAWP outline and the previous documents were identified in a meeting held on April 23, 2014 between AR and the Agencies and in subsequent Agency comments to the outline. Specifically:

1. Combining the 0-1 and 1-6 inch depth intervals for lead into a 0-6 inch sample, as allowed for by the lead handbook if supported by data analysis. Similarly, AR suggested combining the 0-2 and the 2-6 inch depth intervals for arsenic as proposed in the RAWP and SAP outline: “Two separate composite samples will be developed for each yard component. The first composite sample will consist of subsamples from the 0 to 6-inch depth interval. A second composite sample will consist of subsamples from the 6 to 12-inch depth interval.” Area weighted averages (AWA) would be calculated from these depth intervals.
2. Limiting the maximum depth of sampling and remediation for all yard components to 12 inches, except for vegetable gardens, which would be sampled and remediated to 24 inches as proposed in the RAWP and SAP outline: “RA intervals will be the 0 to 6-inch and 6 to 12-inch depth intervals with a maximum depth of 12-inches.” This suggestion is consistent with the *Superfund Lead-Contaminated Residential Sites Handbook* (the lead handbook), but represents a change for arsenic from what was required under the 2002 RAWP/FDR.

This memo is intended to address these issues by providing data and information in support of the protectiveness /effectiveness of ARs proposed approach and to provide the Basis of Design for deviations from the 2013 ROD Amendment, as those deviations may require documentation in an Explanation of Significant Differences.

Issue 1: Combine 0-1 and 1-6 sampling depth intervals for lead and combine 0-2 and 2-6 sampling depth intervals for arsenic

The lead handbook suggest that the 0-1 and 1-6 inch depth intervals can be combined if *"…after collecting a statistically valid number of both 0–1" and 1–6" samples, the project manager may want to compare both sample horizons (e.g., paired-sample t-test; Wilcoxon Rank Sum test) (Gilbert, 1987; Snedecor and Cochran, 1989) to determine if the 0–1" depth can be eliminated (i.e., sample from 0–6"), to further decrease sampling costs."* A paired-samples t-test was conducted to compare lead in the 0-2 inch depth interval to lead in the 2-6 inch depth interval to see if there was a significant difference between the two depth intervals[1]. The paired-samples t-test indicated that there were significant differences between lead in the 0-2 inch depth interval (mean = 589.40) and lead in the 2-6 inch depth interval (mean=334.98), $t_{(2036)}=11.61$, $p=1.62 \times 10^{-30}$. These results suggest that there is a significant difference between the 0-2 inch depth interval and the 2-6 inch depth interval.

As an alternative or supplement to the lead handbook paired sample t-test, EPA expressed in the April 23, 2014 meeting that combing the 0-1 and 1-6 inch depth intervals for lead could be appropriate if analysis of the current data show that a majority of the yard components that would receive RA based on a surface sample would still receive RA if a single 0-6 inch depth interval was used. To evaluate this alternative, historic sample data that have been collected from the start of the original CSOU RAWP implementation were analyzed. The following mixing calculation was applied using the 0-2 and 2-6 depth interval data to estimate a 0-6 inch depth-weighted interval concentration for comparing the number of yard components that exceed the lead action level in each depth interval to the number that exceed based on a combined depth interval.

$$C = \frac{(A*2)+(B*4)}{6}$$

where:
A = 0-2 inch depth concentration
B = 2-6 inch depth concentration
C = calculated 0-6 inch depth concentration

The analysis of the lead data revealed that the majority (87%) of the yard components that had a 0-2 inch depth interval sample exceeding the 400 mg/kg action level for lead would still exceed the action level if a 0-6 inch depth interval was used. Similarly if a yard component had a lead exceedance in the 2-6 in depth interval but not in the 0-2 inch interval, the majority (85%) would still exceed the action level if a 0-6 inch depth interval was used.

Anaconda NPL CSOU Database Lead 0-6 inch Data summary	
1,019	Total number of sample locations with both a 0-2 and a 2-6 inch depth interval
0-6 inch Lead screening with an exceedance in the 0-2 depth interval	

[1] The dataset does not include sample results for 0-1 vs 1-6 inch depth intervals, but within that dataset, 1,019 yard component samples have lead data for both the 0-2 inch and 2-6 inch depth intervals. The 0-2 inch and 2-6 inch depth intervals can reasonably be used as a surrogate for the 0-1 and 1-6 inch sampling depth intervals recommended in the lead handbook.

516	# of Yard Components with a Pb exceedance in the 0-2 inch depth interval with data in 2-6 inch depth interval
447	# of Yard Components with a Pb exceedance based on the estimated 0-6 inch depth interval concentration
87%[2]	Percentage of Yard components with a Pb exceedance in the 0-2 inch depth interval that are also exceeded based on the estimated 0-6 inch depth interval concentration
0-6 inch Lead screening with an exceedance in the 2-6 inch depth interval	
20	# of Yard Components with a Pb exceedance in the 2-6 inch depth interval but not the 0-2 inch depth interval
17	# of Yard Components with a Pb exceedance based on the estimated 0-6 inch depth interval concentration
85%[2]	Percentage of Yard components with a Pb exceedance in the 2-6 inch depth interval but not the 0-2 inch depth interval that are also exceeded based on the estimated 0-6 inch depth interval concentration

Although this analysis of a weighted 0-6 inch depth interval showed that a majority of the yard components would still receive RA, given that the paired sample t-test does not support combining the two depth intervals AR has decided not to pursue combining neither the 0-1 and 1-6 depth interval for lead nor the 0-2 and 2-6 inch depth interval for arsenic for sampling. However, for consistency with historic and currently proposed arsenic sampling AR is proposing the use of 0-2 and 2-6 inch depth intervals for sampling both arsenic and lead.

Issue 2: Change the maximum sampling/remediation depth for arsenic from 18 inches to 12 inches

When performing RA under the original 2002 CSOU design, residential soil removal was extended to a maximum depth of 18”. This 18” Remedial Action Objective (RAO) was based on the maximum rooting depth of native dry land vegetation used as a capping component in Waste Management Areas (WMAs) within other OUs at the Anaconda Smelter NPL Site. The 18” depth RAO had been established at the site for WMAs and was subsequently transferred to address residential soils within the CSOU. However, this RAO is not directly associated with human health risk reduction. Therefore, under the 2014 design proposed in the CSOU RAWP and SAP outline, soil removal will extend to a maximum depth of 12”. The 12” maximum depth of removal is appropriate as it attains the human health risk reduction objectives for metals as specified in the lead handbook. Also consistent with the lead handbook, soil removal within vegetable gardens will extend to a maximum depth of 24”.

Conclusions

Consistent with the original CSOU design, remedial action decisions applicable to removal of soils with arsenic concentrations exceeding the 250 ppm action level will be based on an area weighted average basis. As stated above the analysis of existing data showed that a majority of the yard components get an RA based on a 0-2 or 2-6 inch exceedance would still receive an RA based on a 0-6 inch depth interval. However, given that the paired sample t-test does not support combining the two depth intervals AR has decided not to pursue combining the 0-1 and 1-6

[2] The 85% and the 87% do not consider any overlap.

depth interval for lead or the 0-2 and 2-6 inch depth interval for arsenic. However, for consistency with historic and currently proposed arsenic sampling AR is proposing the use of 0-2 and 2-6 inch depth intervals for sampling both arsenic and lead.

Furthermore, under the design proposed in the updated CSOU RAWP outline, soil removal will extend to a maximum depth of 12 inches and 24 inches for vegetable gardens. The 12 inch maximum depth of removal and 24 inch maximum depth for vegetable gardens is appropriate, as it attains the human health risk reduction objectives for metals as specified in the *Superfund Lead-Contaminated Residential Sites Handbook*. In addition, any area that is not a vegetable garden during the implementation of the CSOU RAWP will still be addressed under the Development Permit System, the Institutional Controls Management Plan and/or the Soil Swap Program.

References

Atlantic Richfield, 2002. *Final Residential Soils Remedial Action Work Plan/Final Design Report (RAWP/FDR)* Atlantic Richfield Company, July 19, 2002.

EPA, 1996. *Record of Decision, Community Soils Operable Unit, Anaconda Smelter NPL Site, Anaconda MT*, United States Environmental Protection Agency and Montana Department of Environmental Quality, September 25, 1996.

EPA, 2003. *Superfund Lead-Contaminated Residential Sites Handbook*, United States Environmental Protection Agency Lead Sites Workgroup. August, 1996.

EPA, 2013. *Record of Decision Amendment, Community Soils Operable Unit, Anaconda Smelter National Priorities List Site, Anaconda, MT*. United States Environmental Protection Agency and Montana Department of Environmental Quality, September, 2013.

ATTACHMENT B-2

TECHNICAL MEMORANDUM #1
BASIS FOR EXCLUDING LIVING SPACE DUST AND ADDRESSING ONLY ACCESSIBLE ATTIC DUST THROUGH ANALYSIS OF EXISTING DATA

ANACONDA COMMUNITY SOILS REMEDIAL ACTION WORK PLAN TECHNICAL MEMORANDUM #1 - BASIS FOR EXCLUDING LIVING SPACE DUST AND ADDRESSING ONLY ACCESSIBLE ATTIC DUST THROUGH ANALYSIS OF THE EXISTING DATA

Background and Purpose

In 1996 EPA released a Record of Decision (ROD) for the Community Soils Operable Unit (CSOU) which specified arsenic action levels for residential properties of 250 mg/kg without assigning an action level to lead or requiring interior dust sampling. In 2013 EPA released an amendment to the 1996 CSOU ROD which expanded on the original ROD to include a lead action level of 400 mg/kg as well as requiring sampling of accessible interior dust along with yard soil when residential sampling is conducted under the program. On March 27, 2014 Atlantic Richfield (AR) submitted an outline of the proposed CSOU Remedial Action Work Plan (RAWP) for implementing the work required under the ROD amendment to EPA and DEQ (the Agencies) in which AR suggested "Interior/attic dust to be sampled only when requested by landowner; and only when an exposure pathway from an attic to living space is present." A subsequent meeting between AR and the Agencies was held on April 23, 2014 to discuss the CSOU RAWP outline. At the meeting and in the subsequent *Comments to the Residential Soils and Interior Dust Remedial Action Work Plan/Final Design Report Annotated Outline Community Soils Operable Unit Anaconda Smelter NPL Site* the Agencies identified there may be appropriate alternatives to address interior dust (living space dust) including developing a basis for excluding interior dust (living space dust) and addressing only accessible attic dust through analysis of the existing data base. This memorandum is to provide data and information in support of the protectiveness/effectiveness of ARs proposed approach as identified in the Agencies' alternative above and to provide the Basis of Design for deviations from the 2013 ROD Amendment, as those deviations may require documentation in an Explanation of Significant Differences.

Conceptual Site Model

This section includes a review of the Conceptual Site Model (CSM) for the original sources of lead and arsenic in living space dust and the mechanisms for transport between living space dust, attic dust and soils to assist in the interpretation of the analysis results. For approximately 100 years the Old Works and Washoe Smelters' emissions of arsenic and lead into the air may have resulted in deposition of particulates containing arsenic and lead onto soils and other surfaces, including inside living spaces and attics within the Anaconda area. While other sources of lead and arsenic emissions to the air over the same timeframe may also have contributed to soil and dust concentrations, the dominant air emission source was likely the smelters. Once deposited onto soil or interior surfaces, further movement of the arsenic and lead in soil and dust would have depended upon a variety of chemical/physical fate and transport factors (e.g., sorption, resuspension and redeposition, etc.), as well as activity-based factors (e.g., track-in, cleaning, tilling garden soil, etc.).

Because living spaces are typically cleaned periodically by residents, recent accessible living space dust concentrations would not be expected to be representative of long-term historical deposition from the air. In contrast, attics are typically not cleaned and tend to be seldom disturbed. Thus, little movement of settled arsenic and lead in attics that originated from historical smelter emissions would be expected in undisturbed attics. Only when the attic dust is disturbed and has a transmission pathway would it migrate into the living space. EPA's *Guidance for the Sampling and Analysis of Lead in Indoor Residential Dust for use in the Integrated Exposure Uptake Biokinetic (IEUBK) Model* describes this more thoroughly: "Contamination of attic dust occurs when ambient air containing pollutants enters the attic and airborne particulate matter settle on attic surfaces such as the floor, insulation, roof, and rafters. In a typical attic, warm air is vented near the peak of the roof. As the warm air is vented, cooler outside air is drawn into the attic through vents and other openings located lower in the attic (e.g., soffit/eave vents). Reduced air flow promotes increased particulate deposition rate and less re-entrainment. Over time, contaminated particles build up in the attic and may remain in the attic for the life of the home if left undisturbed."

Attics in older homes would be expected to have higher concentrations of both lead and arsenic given they were exposed to sources of dust dominated by the smelter emissions for a longer period of time and when smelter emissions were more concentrated (i.e., prior to installation and/or upgrade of pollution controls). Attics in homes built after the smelter was shut down in 1980 would be expected to have lower concentrations of lead and arsenic.

Due to the high prevalence of older homes within Anaconda, deteriorating lead paint on the exteriors and interiors of homes represents another likely source of lead in surface soils and living space dust. Unlike initial deposition of smelter emission sources of lead and arsenic, which ceased to influence lead and arsenic in soils once the smelters were shut down, lead paint on homes built before 1978 can continue to influence lead in soils if the paint is allowed to deteriorate. Given that attic interiors are typically not painted, attics are not expected to have been or continue to be influenced by deteriorating lead paint regardless of when the home was built.

Regardless of the original source(s) of lead and arsenic, transfer of soil particles to interior living spaces can occur as blown or tracked-in dust from soils in the yard. Tracking in particles from attics to interior living spaces is also possible, but it is expected to be a much less significant contributor to living space dust concentrations in homes with infrequently accessed attics. In contrast, renovations or repairs that affect attic spaces represent a temporary yet significant potential contributor of particulate materials from attics to living spaces.

Given the conceptual model described above, we would expect attic dust lead and arsenic concentrations to most closely represent historical smelter emissions in homes built before the smelters ceased operations, particularly the oldest homes that were present throughout most of the 100 year smelting history. In homes built more recently, attic dust concentrations would reflect non-smelter air emission sources. Lead and arsenic in soils may also reflect inputs of historical smelter emissions, though we would not expect the relationship (i.e. ratios) between lead and arsenic concentrations in soils to be as consistent as in attic dust due to the chemical-specific effects of soil on their fate and transport and the additional variable contribution of non-smelter sources (e.g., deteriorating lead paint) to soil concentrations across Anaconda properties. Similarly, lead and arsenic in living space dust are not likely to be very representative of historical smelter deposition from air given typical household activities and the presence of non-smelter sources (e.g., deteriorating lead paint). Living spaces are likely to be influenced by transfer of yard soil particles via blown in or tracked in soil, regardless of the original source of the particles in soil. However, to this point, it is important to note that the procedure for calculating soil cleanup levels for arsenic and lead accounts for incidental ingestion of indoor dust that is derived from soil. Therefore, actions taken for soil are expected to address living space dust derived from soil.

Summary of Living Space and Attic Dust Data

In 2006 and 2007 the exterior, living space, and attics (if accessible) of 52 residential homes within the Anaconda area were sampled and reported in the *Draft Final Community Soils Interior and Attic Dust Characterization Study Data Summary Report (DSR)* (Atlantic Richfield 2008). The primary objective of the characterization study was to determine the distribution and concentration of arsenic and lead in living space and attic dust. In addition yard soils were collected by Atlantic Richfield and EPA for 34 of the 52 residential homes sampled in 2006 and 2007 for dust.

Of the 52 residential homes sampled all 52 had living space dust sampled (see Table 1). The median arsenic concentration for lead and arsenic was 186.5 and 53.1 respectively for the 52 residential homes samples.

Of the 52 residential homes sampled 46 had accessible attics sampled (see Table 1). Consistent with the CSM described above, attic dust samples tend to have greater median concentrations of both lead and arsenic when compared to the living space dust samples. Additionally, none of the attic dust exceedances were in houses constructed after the smelter shut down in 1980.

Table 1 - Living Space Arsenic Dust Summary

	Living Space		Attic	
	Arsenic	Lead	Arsenic	Lead
Total Number of Homes Sampled	52		46	
Minimum Concentration (mg/kg)	11.1	41.8	1.05	2.61
Maximum Concentration (mg/kg)	322	10,700	1,560	2,620
Median Concentration (mg/kg)	53.1	186.5	336.5	497
# Greater than 250 mg/kg As, 400 mg/kg Pb	1	12	26	27
% Greater than 250 mg/kg As, 400 mg/kg Pb	1.90%	23.10%	56.50%	58.70%

Relationship between Arsenic and Lead Concentration in Dust and Soil

The relationship between arsenic and lead concentrations in dust and soil was further evaluated by comparing the geometric mean of lead to arsenic concentration ratios in soil, and attic and living space dust. The values in Table 2 were first calculated by determining the ratio of lead to arsenic for each media lead/arsenic sample. Second the geometric mean was calculated from the lead/arsenic ratios from each media. This approach provides a measure of the central tendency value and is less likely to be influenced by outliers than a mean would be within the dataset. The results of this analysis are summarized in Table 2.

Table 2 - Geometric mean of Lead to Arsenic concentration Ratios

Attic Pb/As	1.75
Yard Pb/As	2.10
Living Space Pb/As	4.01

As shown in Table 2 the concentration of lead is 1.75 times the concentration of arsenic in attic dust. As noted in our description of the CSM, we expect undisturbed attic dust to be most stable with regard to the relationship between arsenic and lead concentrations in smelter related dust, particularly in older homes that were subject to the longest period of smelter impacts. The ratio of the concentrations of lead to arsenic in soils was similar to attics though slightly higher at 2.10 suggesting a slight influence on the lead concentration from an additional sources or weathering of As. However, in living space dust the concentration of lead was a little more the 4 times (4.01) the concentration of arsenic. If soil was the primary source of indoor dust we would not expect the ratio of lead to arsenic in soil and living space dust to be significantly different. Given the lead to arsenic ratio in soil is not similar to the lead to arsenic ratio in living space dust, it is reasonable to conclude that another source is contributing to lead in living space dust. Consistent with the CSM described previously, deteriorating lead paint on interior surfaces is a likely additional source of lead in living space dust and could explain why the concentration of lead is so much higher than arsenic in living space dust.

Conclusions

Based on the presented analysis and the CSM, the following conclusions can be made from the data:

- Existing data show that living space dust is unlikely to exceed arsenic action levels. Given that living space dust is transient, in the unlikely event that living space dust exceeded the arsenic action level due to transfer from yard soils or accessible attics, it would be addressed by remediation of the soil or attic source. Therefore, separate sampling of living space dust should not be required.
- The much higher ratio of lead to arsenic concentrations in living space dust, relative to soil or attics, suggests that a secondary source (most likely deteriorating interior lead paint) is a primary contributor to the living space dust lead concentrations. Development of soil cleanup standards for Pb and As already includes estimation of risk due to exposure of interior dust derived from soil. Thus, collection of living space dust will not inform Superfund cleanup requirements.
- The high rate of arsenic and lead exceedances in attics, which are unlikely to be influenced by deteriorating lead paint, justifies retaining attic dust sampling as an option if there is a pathway for exposure. However, the lack of exceedances in attic dust in homes built after 1980 and lack of exposure to attics without an existing transmission pathway provides the basis for limiting attic sampling to accessible attics in homes built prior to 1980 with a transmission pathway.

References

Atlantic Richfield, 2008. *Draft Final Community Soils Operable Unit Interior and Attic Dust Characterization Study Data Summary Report (DSR)*. January 4, 2008.

EPA, 1996. *Record of Decision, Community Soils Operable Unit, Anaconda Smelter NPL Site, Anaconda MT*, United States Environmental Protection Agency and Montana Department of Environmental Quality, September 25, 1996.

EPA, 2013. *Record of Decision Amendment, Community Soils Operable Unit, Anaconda Smelter National Priorities List Site, Anaconda, MT*. United States Environmental Protection Agency and Montana Department of Environmental Quality, September, 2013.

EPA, 2008. *Guidance for the Sampling and Analysis of Lead in Indoor Residential Dust for use in the Integrated Exposure Uptake Biokinetic (IEUBK) Model*. Prepared by the Lead Committee of the Technical Review Workgroup for Metals and Asbestos Office of Superfund Remediation and Technology Innovation United States Environmental Protection Agency, December 2008. Available online at: http://www.epa.gov/superfund/lead/products/dust_sampling_guidance_final.pdf

Attachment 1
Data Table

Address	Year Built	Arsenic in Yard Soil AWA (mg/kg)	Arsenic in Living Space Dust (mg/kg)	Arsenic in Attic Dust (mg/kg)	Lead in Yard Soil AWA (mg/kg)	Lead in Living Space Dust (mg/kg)	Lead in Attic Dust (mg/kg)	Noted Pathway
214 Locust	1915	331.20	42.00	294.00	1,096.92	649.0	462.0	
1002 W. 4th	1928	179.60	21.60	4.98	517.46	151.0	141.0	
620 W. 3rd	1912	214.60	48.80	360.00	538.71	247.0	955.0	X
811 W. 3rd	1923		29.40	407.00		927.0	511.0	
608 Walnut	1925	157.10	26.40	605.00	616.77	89.5	2580.0	
611 W. 6th	1917	116.50	53.60	462.00		189.0	459.0	
1806 W. Park	1954	89.70	16.20	5.36	183.06	85.1	13.7	
1603 Copper Road	1958	75.80	24.30	27.10	99.06	70.5	101.0	
1610 Tammany	1951	64.50	30.80	236.00	210.89	144.0	306.0	
422 Hickory	1880	142.20	52.30	368.00	886.49	4850.0	2620.0	
1707 Ogden	1953		101.00	6.90		70.3	19.5	
604 W. Park	1950	129.32	69.10	1460.00	543.92	408.0	1320.0	
620 W. 4th	1912	187.20	37.90	878.00	799.58	136.0	1560.0	
803 W. 7th	1955	256.30	38.80	875.00	151.69	70.4	575.0	
2008 W. Park	1955		35.10	45.90		103.0	115.0	
805 W. 3rd	1922	168.50	59.80	130.00	451.71	351.0	196.0	
217 Maple	1905		91.80			790.0		
813 E. Park	1905	300.90	73.40	617.00	1,126.96	304.0	776.0	
107 N. Main	1910	164.10	62.50	722.00	530.02	355.0	903.0	
801 E. 3rd	1906	334.40	30.90	928.00	350.39	172.0	804.0	
821 E. 5th	1881	185.10	61.30	313.00	553.38	322.0	480.0	
612 E. 4th	1908	120.80	35.60	806.00	341.99	184.0	1020.0	X
521 E. Commercial	1910	199.50	91.90	796.00		10700.0	1630.0	
712 Chestnut	1922	202.90	88.30	1420.00	587.99	446.0	2180.0	X
603 E Front	1916	199.90	81.20	1450.00	569.78	639.0	1140.0	X
600 Alder	1917	224.10	41.40	1460.00	772.17	672.0	1600.0	
708 Alder	1900	112.90	77.20	1520.00		450.0	1210.0	
600 E. Commercial	1955	228.30	46.10	297.00	572.78	244.0	483.0	
303 Ash	1920	283.00	65.50	1140.00		598.0	935.0	
606 E. Commercial	1912	217.30	46.80	471.00	662.34	297.0	526.0	
900 E. 6th St	1923	361.10	81.30	584.00	324.75	232.0	1870.0	
806 E. 5th	1916	78.70	52.60	1560.00		328.0	1700.0	X
616 Rickards	1976	99.90	28.00	204.00	183.24	41.8	190.0	

Address	Year Built	Arsenic in Yard Soil AWA (mg/kg)	Arsenic in Living Space Dust (mg/kg)	Arsenic in Attic Dust (mg/kg)	Lead in Yard Soil AWA (mg/kg)	Lead in Living Space Dust (mg/kg)	Lead in Attic Dust (mg/kg)	Noted Pathway
410 Rickards	1957	56.90	91.90	648.00	132.50	116.0	601.0	
814 Rickards	1954		55.30	56.90		122.0	315.0	X
1110 Smith St.	1969	75.60	42.60	5.09		71.7	6.7	
103 Stewart	1930	69.80	82.70	16.90	330.22	344.0	29.1	
600 Rickards	1920	162.50	49.70	5.17	234.37	110.0	7.8	
808 Stewart	1930	68.40	37.40	155.00	87.91	112.0	149.0	
408 S. Hauser	1910	99.00	161.00	183.00		275.0	903.0	
515 Stewart	1920	199.90	117.00	84.40	195.50	197.0	64.2	X
305 S. Hauser	1976	53.00	11.10	14.90		43.7	22.7	
4507 Crackerville	1978	131.50	31.80	6.94	454.41	755.0	22.9	
1218 Hwy 1 West	1930	58.20	61.50	1070.00		129.0	822.0	
46 Mountain View	1955		56.20	76.30		102.0	106.0	
100 Cutthroat Trl	1999	680.90	167.00		351.43	148.0		
100 Outlaw Trail	1994	801.40	322.00		403.22	203.0		
100 N. Juniper	2001		36.00	2.27		96.4	24.3	X
1101 Sunlight Basin	2003		35.70	1.05		65.7	2.6	X
6285 Aspen Hills Road	2007	496.90	69.60		341.85	103.0		
6300 Aspen Hills	2005	128.80	89.80		168.04	64.1		
1157 Galen Rd.	2001		113.00			99.8		

ATTACHMENT B-3

AGENCY APPROVAL LETTER
FOR TECHNICAL MEMORANDA #1 AND #2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 W. 15th STREET, SUITE 3200
HELENA, MONTANA 59626

Ref: 8MO

September 8, 2014

Mr. Luke Pokorny
Atlantic Richfield Company
317 Anaconda Road
Butte, Montana 59701

Dear Luke:

EPA, in consultation with DEQ, approves, with comment, Atlantic Richfield's *Community Soils Operable Unit (CSOU) Residential Soils and Attic Dust Remedial Action Work Plan/Final Design Report and SAP Annotated Outlines, dated August 15, 2014.* No revisions of the outlines are necessary. Please proceed with the development of the draft Remedial Action Work Plan/Final Design Report (RAWP/FDR).

Please note that some of the proposed work plan elements differ from the 2013 CSOU ROD Amendment. These changes will need to be described in an EPA Explanation of Significant Differences (ESD). In order to coordinate the development of the RAWP/FDR and ESD, I suggest that we set up a meeting at your earliest convenience. If you have any questions, please give me a call.

Sincerely,

Charles Coleman
Anaconda Project Manager

Enclosure

cc: Andy Lensink, ENF-L
Joel Chavez, DEQ
Katherine-Haque-Hausrath, DEQ
Ken Brockman, BOR
Gunnar Emilsson, CDM
Connie Daniels, ADL

AR: Roy Thun, AR
Shannon Dunlap, AR
Jill Kelley, AR
John Davis, PRR
Kevin Bethke, TREC
Duane Logan, PTS

Comments to the
Residential Soils and Interior Dust Remedial Action Work Plan/Final Design Report Annotated Outline
Community Soils Operable Unit
Anaconda Smelter NPL Site

General Comments

The Atlantic Richfield Company (AR) submitted an outline of the Community Soils OU Residential Soils and Interior Dust Remedial Action Work Plan/Final Design Report (RAWP/FDR) to EPA and DEQ (the Agencies) on March 27, 2014. Upon initial review, the Agencies provided a list of discussion items which were discussed with AR on April 23. Following this meeting, the Agencies submitted comments to the outlines On May 8, 2014.

In response to these comments, on August 15, 2014, AR submitted the following documents:

1. Comment Responses to the Draft CS OU Residential Soils and Attic Dust Remedial Action Work Plan/Final Design Report Annotated Outline;

2. Comment Responses to the Draft CS OU Residential Soils and Attic Dust Sampling and Analysis Plan Annotated Outline;

3. Draft Final CS OU Residential Soils and Attic Dust Remedial Action Work Plan/Final Design Report Annotated Outline;

4. Draft Final CS OU Residential Soils and Attic Dust Sampling and Analysis Plan Annotated Outline;

5. Anaconda Community Soils Remedial Action Work Plan Technical Memorandum #1 – Basis for Excluding Living Space Dust and Addressing Only Accessible Attic Dust through Analysis of the Existing Data; and

6. Anaconda Community Soils Remedial Action Work Plan Technical Memorandum #2 – Modifying the Sample Depth Intervals used to make Remedial Decisions for Arsenic and Lead in Yard Soils.

The technical memoranda were submitted in response to the Agencies' comment that the basis for proposed design criteria presented in the RAWP/FDR outline should be presented for review as either part of the design or as stand-alone technical memoranda. As these technical memoranda support the proposed design presented in the outline, they will be reviewed first.

Attachment 5 - Anaconda Community Soils Remedial Action Work Plan Technical Memorandum #1 – Basis for Excluding Living Space Dust and Addressing Only Accessible Attic Dust through Analysis of the Existing Data

This technical memorandum summarizes the existing interior and attic dust sampling and analytical results completed to date, and provides a justification for excluding interior dust sampling from the RA while retaining accessible attic dust sampling in homes built before 1980 (when the smelter ceased operations).

The conceptual site model (CSM) for dust presented in the technical memorandum is well written and is consistent with the 1996 Community Soils OU ROD CSM, which was used to develop the Selected Remedy (e.g., cleaning up the soil will clean up the interior dust). The statistical analysis presented in the technical memorandum supports the CSM assumption that the primary source of elevated lead in interior dust in older homes is likely lead paint.

Analysis of the provided data set indicates that only one of the 52 homes sampled for interior dust exceeded the 250 mg/kg action level for arsenic. That home is located in the Aspen Hills subdivision, and had soils area-weighted arsenic concentration of 801 mg/kg (the highest arsenic concentration for soils for the 52 residences). This affirms the CSM that the principal source of arsenic to interior dust is the soils.

The October 2008 Residential Soils Data Interpretation and Analysis Report (CDM Smith 2008) showed that the correlation between arsenic and lead concentrations in soil was statistically significant. This technical memorandum shows that there is no correlation between arsenic and lead for interior dust in the available data set, with the reasonable postulated thesis that arsenic and lead from the smelter would have been cleaned up, so that the likely source of the elevated lead in interior dust (12 out of the 52 homes sampled) is from deteriorating lead paint in older homes. The technical memorandum provides ratios of the geometric means arsenic and lead concentrations of soil, interior dust, and attic dust, and notes that while the soil and attic dust ratios are similar, the interior dust is skewed towards lead. Review of the 12 residences where lead in interior dust exceeds 400 mg/kg show that they are older homes with one exception. That exception, a home built in 1978, is located in Crackerville, an area previously identified as an elevated lead area due to the presence of fluvial tailings deposited from past Silver Bow Creek flooding. That residence also had lead exceeding 400 mg/kg in the soils.

In summary, the analysis and conclusions presented in Technical Memorandum #1 are supported by the data, and it can be approved without comment.

Attachment 6 - Anaconda Community Soils Remedial Action Work Plan Technical Memorandum #2 – Modifying the Sample Depth Intervals used to make Remedial Decisions for Arsenic and Lead in Yard Soils

This technical memorandum reviews the proposed sampling depth interval modifications that were proposed in the draft March 27, 2014 outline. The proposed modification was use 0 to 6 inch and 6 to 12 inch sampling depth increments, in lieu of the 0 to 2 inch, 2 to 6 inch, and 6 to 12 inch increments used historically in Anaconda and the 0 to 1 inch, 1 to 6 inch, and 6 to 12 inch increments used in EPA's Lead Handbook. Following Lead Handbook guidance, AR used the existing screening level data for Pb and completed a paired sample t-test, the results of which suggested that "that there is a significant difference between the 0-2 inch depth interval and the 2-6 inch depth interval".

Based on this difference, AR has elected not to pursue the 0 to 6 inch and 6 to 12 inch sampling increment proposal, but to sample both arsenic and lead following the existing 0 to 2 inch, 2 to 6 inch, and 6 to 12 inch sampling increments. The Agencies concur, as keeping with the previous sampling intervals will allow these data to be more readily compared to the historical data set for Five Year Review purposes.

The second objective of Technical Memorandum #2 is to justify limiting the remedial action to 18 inches. The technical memorandum notes that the 18 inch removal criteria was carried over in the 1996 Community Soils OU Record of Decision from criteria original developed for minimum plant growth media thickness placed over waste material. As the 2003 Pb Handbook identified a 12 inch cover as protective of human health, changing the arsenic cleanup requirement to be consistent with the Pb Handbook is appropriate. Note that vegetable gardens will still receive 24 inches of cleanup where warranted.

This will require the Agencies to evaluate this proposal as part of an Explanation of Significant Differences (ESD) to the 1996 ROD in the future. As currently drafted, the DPS requires cleanup of all contaminated soil exceeding the cleanup levels. In order to ensure that the remedy remains protective, the DPS must continue to address cleanup of soil that exceeds the residential cleanup levels from 0-2 feet bgs.

Attachments 1 and 3 - Draft Final CS OU Residential Soils and Attic Dust Remedial Action Work Plan/Final Design Report Annotated Outline and Comment Responses

Overall, the comment responses are acceptable. The Agencies have a few points of clarification that should be addressed in the RAWP/FDR submittal (no response to comments is necessary).

Section 1.5 Community Soils OU Remedial Action Objectives, last bullet states that attic dust will be sampled if accessed more than once a week or the property owner has remodeling plans and **"and a construction permit has been granted by ADLC."** It is the Agencies' understanding that ADLC does not issue construction permits for all renovation projects. Therefore, the Development Permit System (DPS) likely must address the issuance of construction permits for all projects that could spread contaminated dust from attics to the interior. This needs to be addressed in the DPS revisions currently under development.

Consistent with previous Community Soils OU RA, all visible wastes should continue to be removed, regardless of depth.

Section 3.0, Basis of Design, third bullet states: "This 18 inch Remedial Action Objective (RAO) was based on the maximum rooting depth of native dry land vegetation used as a capping component in Waste Management Areas (WMAs) within other OUs at the Anaconda Smelter NPL Site." This statement is inaccurate. Section 9.1 of CSOU ROD states: "The maximum 18-inch depth is based upon possible activities that might be conducted in a yard (i.e., garden, play area, or other excavation)."

Section 3.0, Basis of Design, sixth bullet states: "Soil removal within residential yards will extend laterally until encountering an existing barrier (e.g., concrete sidewalk or foundation, tree roots, **property boundary,** asphalt pavement, etc.)." It is the Agencies' understanding that the area that is remediated will be tracked in the GIS database, which will provide notice to ADLC and property owners that contaminated soil and/or waste around tree roots, under pavement, etc., was/will not be remediated, and such contamination will be addressed by the DPS if disturbed in the future. However, please delete "property boundary" from this list, because contaminated soil should be cleaned up from adjacent properties unless Atlantic Richfield (AR) is unable to obtain access.

Sections 3.0, 5.2, 6.2: These sections state: "Insulation will not be replaced in attics unless/until all electrical components that may be present in the attic comply with applicable residential electrical codes." The document implies that insulation may be removed and not replaced. Given Montana's climate, it is not acceptable to remove attic insulation without replacing it. The work plan should clarify that no insulation will be removed unless AR will replace it.

Section 5.6.1: "A maximum of eight (8) soil subsamples will be collected from any individual residential yard, school, park, etc., component regardless of the surface area of that component." Please note that larger parcels, including schools, may require multiple components to ensure protectiveness.

Section 8.0, Remedial Action Schedule. In this section, AR proposes five years for property owners to sign up for the "test by request" program, although the yard cleanups might continue for longer than five years. After five years, the test by request program would be closed, but the DPS would apply if soil is disturbed on those properties. In order to ensure that property owners have adequate time to sign up for the test by request program, the Agencies would like the deadline to sign up for the test by request program to extend at least a year past the time that the majority of the yard cleanups are completed. This would provide for a "last call," so that property owners who see remediation occurring elsewhere are able to sign up for the test by request program.

Attachments 2 and 4 - Draft Final CS OU Residential Soils and Attic Dust Sampling and Analysis Plan Annotated Outline and Response to Comments

In response to the Agencies' comment to Section 3 that "EPA has established a method to determine if the cleanup was effective. Refer to: Lead Dust Sampling Technician Field Guide (EPA Office of Pollution Prevention and Toxics, EPAW- 04-022, May 2009)", AR responded with "comment noted." The Agencies would like to clarify that the confirmation sampling methodology and a clearance level of 40 $\mu g/ft^2$ for floors, that is presented in the guidance document, will be provided in the QAPP.

End of comments.

ATTACHMENT C

SAMPLING FIELD DATA SHEETS

ATTACHMENT C-1

RESIDENTIAL YARD SAMPLING FIELD DATA SHEET

Anaconda Smelter NPL Site – Community Soils Operable Unit
Residential Yard Sampling Field Data Sheet

Sample Identifier – ____________________ Date-________________ Time - _____________

Owner____________________________

Address - ____________________________ Phone Number - ____________________

Samplers - ____________________ Weather - _________________________

Owner Present - _____________

Describe Hazards/Obstacles in the Yard and Control Measures Identified:

COMPONENTS SAMPLED

Component	Feet^2	No. of Samples	No. of Holes	Sample in Drip Zone	Comments

PHOTOGRAPHS

House and Trim Color**:**
Photographers Name:

Number	Time	Description
		Front of house looking (N, S, E, W)

Location	Sample ID	Component	Depth	QA/QC
A – Anaconda OP – Opportunity R – Regional Area	0001 – first sample location 0002 – second sample location	FY-front yard, BY-back yard, ED-earthen drive, FG-flower garden, , VG-vegetable garden, , PA-play area, BA-bare area, SA-source area, BV-boulevard	0002 – 0” to 2” 0206 – 2” to 6” 0612 – 6” to 12” Also for VG and FG only: 1218 – 12” to 18” 1824 – 18” to 24”	D-Duplicate B-Blank M-2586 M2-2711a

Examples: A-0001-BA-0206-B; A-0005-FG-0612

Anaconda Smelter NPL Site – Community Soils Operable Unit
Residential Yard Sampling Field Data Sheet

GENERAL INFORMATION:

Type of Roof: __________________ Condition: ____________________
Type of Siding: _____________________ Condition: ____________________
Exterior Lead Paint? Y / N Peeling Paint? Y / N
Type of Trim (Windows, doors, eaves) ____
Condition of trim: ____
Outbuildings/Type? __________________ Condition: ____________________
Porch/Other: _________________ Condition: ____________________
Gutters? ____________________ Type(s):________ Condition:_____________________
Sprinkler System Present? _____ Location: _________________________________
Fence Present?_____ Type(s):____________ Condition:_________________

SAMPLES COLLECTED

Metals to Analyze for: **As, Pb**

Sample ID Sample Identifier :	Time	No. of Holes	QA/QC	Paint chips /Amount	Comments

COMMENTS:

Anaconda Smelter NPL Site – Community Soils Operable Unit
Residential Yard Sampling Field Data Sheet

Sample Identifier – _________________ Date-_________________ Time - ______________

CONTINUATION: PHOTOGRAPHS

House and Trim Color**:**
Photographers Name:

Number	Time	Description

CONTINUATION: SAMPLES COLLECTED

Metals to Analyze for: **As, Pb**

Sample ID Sample Identifier :	Time	No. of Holes	QA/QC	Paint chips /Amount	Comments

ATTACHMENT C-2

UNPAVED ROADS & ALLEYS SAMPLING FIELD DATA SHEET

Anaconda Smelter NPL Site – Community Soils Operable Unit
Unpaved Roads and Alley Sampling Field Data Sheet

Sample Identifier – ________________ Date-_________________ Time - ______________

Owner________________________ Phone Number - _______________________

Samplers - _____________________ Operator - _____________________ Weather - _____________

Describe Hazards/Obstacles in the Yard and Control Measures Identified:

PHOTOGRAPHS

Photographers Name:

Number	Time	Description

Anaconda Smelter NPL Site – Community Soils Operable Unit
Unpaved Roads and Alley Sampling Field Data Sheet

Site Code	Sequential Letter Code	Sequential Number Code	Letter Code	QA/QC
A – Anaconda **OP – Opportunity** **R – Regional Alley**	**A –** First unpaved road or alley segment from south to north. **B –** Second unpaved road or alley segment south to north.	**01** – First Unpaved road or alley segment of block from west to east. **02** – Second unpaved road or alley segment of block from south to north.	**A** – Alley	**D**-Duplicate **B**-Blank **M**-2586 **M2**-2711a

Examples: A-B-02-A, A-B-02-A-M

SAMPLES COLLECTED

Metals to Analyze for: **As, Pb**

Sample ID Sample Identifier :	Time	No. of Holes	QA/QC	Paint chips /Amount	Comments

COMMENTS:

ATTACHMENT C-3

ATTIC DUST IN-HOME SAMPLING DATA SHEET

Anaconda Smelter NPL Site – Community Soils Operable Unit
Attic Dust In-Home Sampling Data Sheet

Circle most correct answer(s)				
Date:		**Address:**		
Team member:		**Area:**		
Features of Attic				
Insulation	PACM vermiculite	fibrous glass batt, faced	fibrous glass batt, unfaced	Blown in, type:

Does the current attic electrical wiring meet code?	Yes		No	

Photos Checklist	Unique attic features	
	Sampling sites ( )	
	General attic configuration	
	Dust accumulation	
	Other:	

Sampling Information								
Sampler		Time						
Sample ID		Duplicate Collected? Y / N						
Pump Serial Number								
Pump Calibration, (L/min)	Date		Start		Stop		Average	
Sample Duration, (min)								
Comments:								

Location(s) Sampled:			
Location: Surface: Area Samples (cm^2):	Location: Surface: Area Samples (cm^2):	Location: Surface: Area Samples (cm^2):	Location: Surface: Area Samples (cm^2):

Lab Sample #:	
Comments:	

Instructions: Circle description(s) ( ) = Fill in number in category Type: specify in

ATTACHMENT D

LEAD DUST SAMPLING TECHNICIAN FIELD GUIDE

What Is the Field Guide?

This guide will help determine that a recently-renovated area has been cleaned sufficiently. The Lead Dust Sampling Technician Field Guide should be used by lead dust sampling technicians. The guide provides protocols for conducting post-renovation clearance under EPA's Renovation, Repair, and Painting Rule (RRP) covering housing and child-occupied facilities built before 1978, and clearance examinations under HUD's Lead Safe Housing Rule (LSHR) in federally-assisted housing built before 1978. This guide also provides federal standards for maximum allowable contamination levels of residual lead dust.

How To Use This Guide

Take this guide with you on site when you perform clearance, including visual inspections. It serves as a quick reminder of:

- When and where to take lead dust clearance samples;
- The step-by-step instructions for taking a dust wipe sample; and
- EPA/HUD clearance standards for lead dust.

When To Perform Lead Dust Clearance Tests

Renovation activities that disturb lead-based paint can create lead dust so proper cleanup after these jobs is critical. The purpose of lead dust clearance is to determine if the area is safe for re-occupancy.

Lead dust clearance is performed:

- After renovation, repair, painting, and cleaning activities are finished in property built before 1978 and where children are assumed to spend time.
- After hazard reduction or maintenance activities in most federally-assisted properties built before 1978 that are covered by HUD's LSHR.

Lead dust sampling technicians should NEVER perform post-abatement clearance. (Abatement—as opposed to renovation, repair and painting—is a term used for the complete removal of lead.) When performing clearance, the lead dust sampling technician is required to bring a copy of his or her certificate of initial training to the worksite.

Where To Collect Samples for Lead Dust Clearance Tests

If there is more than one room, hallway, or stairwell within the work area, take:

- One windowsill sample and one floor sample within each room, hall way, or stairwell (no more than four rooms, hallways, or stairwells need be sampled).
- If the windows were not closed and covered with plastic during the renovation, also take one window trough sample in each room, hall way, or stairwell (no more than four need be sampled).
- One floor sample adjacent to the work area, but not in an area that has been cleaned.

For federally-assisted housing, take these samples if the work area is contained, otherwise, clear the whole unit.

If the work area is a single room, hallway, or stairwell, or a smaller area, take:

- One windowsill sample and one floor sample.
- If the windows were not closed and covered with plastic during the renovation, also take one window trough sample.
- One floor sample adjacent to the work area, but not in an area that has been cleaned.

Equipment List

- Disposable lead dust wipes (individually wrapped)
- Disposable gloves
- Disposable shoe covers
- Sample tubes with caps
- Re-usable templates
- Masking or painter's tape
- Ruler
- Sample collection forms
- Chain-of-custody forms
- Markers, trash bags, labels, pens, re-sealable storage bags
- Calculator
- Sanitary wipes

Check with your laboratory for their sampling requirements

Visual Inspections

Lead dust clearance testing for both EPA's RRP Rule and HUD's LSHR requires a visual inspection as a first step in the clearance process:

- Under both HUD and EPA rules, the visual inspection is designed to determine if the area is free of visible dust and debris before lead dust clearance testing can begin.

In addition, under HUD's rule the visual inspection determines whether the unit/work area (interior and exterior) is clear of visible conditions that can result in exposure to lead-based paint hazards:

- Deteriorated paint
- Chips or debris
- Visible dust

Lead Dust Wipe Sampling

Single or composite samples can be taken; however, single-surface sampling is recommended to get results for specific surfaces. Use durable, re-usable 12" x 12" sampling templates, a disposable template, or use tape to lay out the sampling area.

Step One: Put on disposable shoe covers and lay out the sample area

- Clean template with a new wipe.
- Tape template to surface.
- If no template, outline with tape.
- Using tape to lay out the sample area, make sure that on floors the tape is laid in a square. On sills and troughs, the tape should be laid perpendicular to the sill.
- DO NOT touch the area inside the template.

Note: Use disposable shoe covers when walking between buildings and remove shoe covers before entering your vehicle to help minimize the spreading of settled lead dust from one location to another.

Step Two: Prepare the sample tubes

- Use clean tubes.
- Label tube with ID number.
- Record ID number on sample collection form and chain-of-custody form.
- Partially unscrew tube cap.
- Place tube near sample area.

Step Three: Put on clean gloves

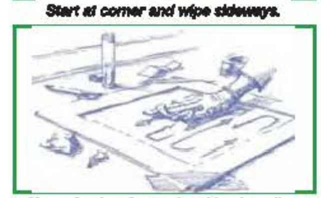
- Use disposable gloves.
- Use new gloves for each sample.
- DO NOT touch anything except the wipe after putting on the gloves.

Step Four: Wipe sample area and place wipe in sample tube

- Do not touch other objects.
- Press the wipe down firmly at an upper corner of the sample area.
- Make as many "S"-like motions as needed to wipe the entire sample area, moving from side to side. Do not cross the outer border of the tape or template.
- Fold the wipe in half, keeping the dirty side in, and repeat the wiping procedure in the original direction in a forward and back motion.
- Fold the wipe again and repeat the wiping procedure, concetrating on collecting dust from the edges and corners of the sample area.

Floors

Start at corner and wipe sideways.



Now wipe in a forward and back motion.

Step Four: **(Continued)**

- Fold the wipe again with the sample side folded in, and place the folded wipe into the sample tube.
- Cap the container. Discard the gloves into a trash bag.
- Label the centrifuge tube and record the dimensions of the sampling area.

Step Five: **Measure the sample area**

- Measure width and length (unless template was used).
  - Length of sill or trough between edges of tape
  - Width of sill or trough, measure at tape
- Measure to 1/8 inch.
- Do not remove tape until after measurements are taken.

Step Six: **Record sample area dimensions on forms**

- Calculate the sample area and record on sample collection form and laboratory chain-of-custody form.

Step Seven: **Clean up**

- Clean template with a clean wipe; place in a plastic bag for storage.
- Remove materials from site:
  - Gloves, tape from floors and windows, and used shoe covers
  - Put items in trash bag, NOT in client's trash containers
- Clean face and hands with warm, soapy water.
  - Use sanitary wipes if you do not have access to warm, soapy water
- Send the samples to a laboratory recognized by the National Lead Laboratory Accreditation Program (NLLAP) as being proficient in lead in dust analysis. For information on locating EPA-accredited labs, visit http://www.epa.gov/lead/pubs/nllaplist.pdf.

Evaluate the Results

- Compare the laboratory results to the EPA clearance standards for maximum allowable residual lead dust provided below:
  - Floors: 40 micrograms per square foot (µg/ft²)
  - Interior windowsills: 250 µg/ft²
  - Window troughs: 400 µg/ft²

These standards are for single-surface samples. The clearance standards for composite samples will be different depending on how many sub-samples are collected. Before collecting composite samples, check with your laboratory. Note that HUD discourages composite sampling when clearing federally-assisted housing.

Write the Report

- Use the standard report format.
- Sign the report.

Useful Resources

National Lead Information Center
1-800-424-LEAD (1-800-424-5323)
http://www.epa.gov/lead/pubs/nlic.htm

For a wide range of lead information—from outreach brochures to technical reports—on lead-based paint in the home.

National Lead Laboratory Accreditation Program
http://www.epa.gov/lead/pubs/nllaplist.pdf

For information on locating EPA-accredited labs.

Office of Pollution Prevention and Toxics
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW (7404T)
Washington, DC 20460
202-566-0500
http://www.epa.gov/lead

For information on EPA lead-based paint regulations.

Office of Healthy Homes and Lead Hazard Control
U.S. Department of Housing and Urban Development (HUD)
451 Seventh Street, SW
Washington, DC 20410
202-755-1785
http://www.hud.gov/offices/lead

For information on the HUD lead-based paint regulations and technical assistance in complying with the HUD regulations for HUD-funded work.

United States Environmental Protection Agency | Office of Pollution Prevention and Toxics | EPA-W-04-022 May 2009

Lead Dust Sampling Technician Field Guide

ATTACHMENT E

CORRECTIVE ACTION REPORT

Corrective Action Report/
Corrective Action Plan

Project ID	Project Name	Document ID

Preparer's Signature/Submit Date	Submitted to:

Description of the requirement or specification	
Reason for the Corrective Action	
Location, affected sample, affected equipment, etc. requiring corrective action	(Continue on Back)
Suggested Corrective Action	(Continue on Back)
Corrective Action Plan	☐ Approval signature/date:____________________ Approval of corrective actions required by EPA? ☐ Yes ☐ No ☐ EPA approval name/date:____________________ ☐ Corrective actions completed name/date:____________________ (Continue on Back)
Preventative Action Plan	☐ Preventative actions completed name/date:____________________

Corrective Action Report/
Corrective Action Plan

Suggested Corrective Action (Continued)	
Corrective Action Plan (Continued)	
Preventative Action Plan (Continued)	

ATTACHMENT F

LEVEL A/B SCREENING CHECKLIST

I. General Information

Site:
Project:
Client:
Sample Matrix:

II. Screening Results

Data are:

1) Unusable ☐
2) Level A ☐
3) Level B ☐

I. Level A Screening

Criteria – The following must be fully documented:	Yes/No	Comments
1. Sampling date	Yes	
2. Sampling team or leader	Yes	
3. Physical description of sampling location	Yes	
4. Sample depth (soils)	N/A	
5. Sample collection technique	Yes	
6. Field preparation technique	N/A	
7. Sample preservation technique	Yes	
8. Sample shipping records and laboratory analysis dates	Yes	
9. Companion sampling efforts	Yes	
10. Visual classification of samples	Yes	

II. Level B Screening

Criteria – The following must be fully documented:	Yes/No	Comments
1. Field/laboratory instrumentation, standardization and methods/procedures	Yes	
2. Proper sample containers and container preparation	Yes	
3. Collection of field replicates (1/20 minimum)	Yes	
4. Proper and decontaminated sampling equipment	N/A	
5. Identity of sample taker	Yes	
6. Field custody documentation	Yes	
7. Shipping custody documentation	Yes	
8. Traceable sample designation number	Yes	
9. Field notebooks, custody records in secure repository	Yes	

10. Properly prepared and complete field forms	Yes	
11. Physical data/observations date and time	Yes	
12. Physical data/observations recorder, team leader	Yes	
13. Physical data/observation location	Yes	

ATTACHMENT G

QAPP CROSSWALK

EPA REGION 8 QA DOCUMENT REVIEW CROSSWALK

QAPP/FSP/SAP for: *(check appropriate box)* [ ] **GRANTEE** [ ] **CONTRACTOR** [ ] **EPA** X **Other**	**Entity** *(grantee, contract, EPA AO, EPA Program, Other)* PRP	**Regulatory Authority** **and/or** **Funding Mechanism**	**___40 CFR 31 for Grants** **___48 CFR Part 46 for Contracts** **___ Interagency Agreement** **___ EPA Administrative Order** **___ EPA Program Funding** **___ EPA Program Regulation** **___ EPA CIO 2105**
Document Title ***[Note: Title will be repeated in Header]***	Draft Final Residential Soils/Dust Quality Assurance Project Plan		
QAPP/FSP/SAP Preparer	Pioneer Technical Services, Inc.		
Period of Performance *(of QAPP/FSP/SAP)*	Fall 2015 through completion	**Date Submitted for Review**	
EPA Project Officer **EPA Project Manager**	Charlie Coleman	**PO Phone #** **PM Phone #**	
QA Program Reviewer or Approving Official		**Date of Review**	

Documents to Review:

1. QAPP written by Grantee or EPA must also include for review:
Work Plan(WP) / Statement of Work (SOW) / Program Plan (PP) / Research Proposal (RP)

2. QAPP written by Contractor must also include for review:
- a) Copy of signed QARF for Task Order
- b) Copy of Task Order SOW
- c) Made available hard or electronic copy of approved QMP
- d) If QMP not approved, provide Contract SOW

3. For a Field Sampling Plan (FSP) or Sampling & Analyses Plan (SAP), the Project QAPP must also be provided.
OR
The FSP or SAP must be clearly identified as a stand-alone QA document and must contain all QAPP required elements (Project Management, Data Generation/Acquisition, Assessment and Oversight, and Data Validation and Usability).

Documents Submitted for QAPP Review:

1. QA Document(s) submitted for review:

QA Document	**Document Date**	**Document Stand-alone**	**Document with QAPP**
QAPP		Yes / No	
FSP		Yes / No	Yes / No
SAP		Yes / No	Yes / No
SOP(s)			Yes / No

2. WP/SOW/TO/PP/RP Date ___________
WP/SOW/TO/RP Performance Period _____________

3. QA document consistent with the:
WP/SOW/PP for grants? _Yes / No
SOW/TO for contracts? _Yes / No

4. QARF signed by R8 QAM Yes / No / NA
Funding Mechanism _IA / contract / grant / NA
Amount _____________

Summary of Comments *(highlight significant concerns/issues)***:**
1. Comment #1
2. Comment #2
3. Comment #3
4. **The** PRP **must address the comments in the Summary of Comments, as well as those identified in the Comment section(s) that includes a "Response (date)" and Resolved (date)".**

Element	Acceptable *Yes/No/NA*	Page/ Section	Comments
A. Project Management			
A1. Title and Approval Sheet			
a. Contains project title		Title Page	
b. Date and revision number line (for when needed)		Following TOC	
c. Indicates organization's name		Title Page	
d. Date and signature line for organization's project manager		Approval Page	Page i of vii
e. Date and signature line for organization's QA manager		Approval Page	Page i of vii
f. Other date and signatures lines, as needed		Approval Page	Page i of vii
A2. Table of Contents			
a. Lists QA Project Plan information sections		TOC	Page iii through vii
b. Document control information indicated		Following TOC	Page v of vii
A3. Distribution List			
Includes all individuals who are to receive a copy of the QA Project Plan and identifies their organization		Distribution List	Page ii of vii
A4. Project/Task Organization			
a. Identifies key individuals involved in all major aspects of the project, including contractors		Section 2.1 & Figure 1	
b. Discusses their responsibilities		Section 2.1	
c. Project QA Manager position indicates independence from unit generating data		Section 2.1	
d. Identifies individual responsible for maintaining the official, approved QA Project Plan		Section 2.1	
e. Organizational chart shows lines of authority and reporting responsibilities		Figure 1	
A5. Problem Definition/Background			
a. States decision(s) to be made, actions to be taken, or outcomes expected from the information to be obtained		Section 2.2	
b. Clearly explains the reason (site background or historical context) for initiating this project		Section 2.2	

c. Identifies regulatory information, applicable criteria, action limits, etc. necessary to the project		Section 2.4.2	
A6. Project/Task Description			
a. Summarizes work to be performed, for example, measurements to be made, data files to be obtained, etc., that support the project=s goals		Section 2.3	
b. Provides work schedule indicating critical project points, e.g., start and completion dates for activities such as sampling, analysis, data or file reviews, and assessments		Section 2.3 & Table 1	
c. Details geographical locations to be studied, including maps where possible		Section 2.2 & Figure 2	
d. Discusses resource and time constraints, if applicable		N/A	Long term project.
A7. Quality Objectives and Criteria			
a. Identifies - performance/measurement criteria for all information to be collected and acceptance criteria for information obtained from previous studies, - including project action limits and laboratory detection limits and - range of anticipated concentrations of each parameter of interest		Section 2.4	
b. Discusses precision		Sections 3.3.1 & 3.3.2 Attachments A-2 & A-3	
c. Addresses bias		Section 3.3.2 Attachments A-2 & A-3	
d. Discusses representativeness		Section 2.4.2	
e. Identifies the need for completeness		Section 2.4.2	
f. Describes the need for comparability		Section 2.4.2	

g. Discusses desired method sensitivity		Attachments A-2 & A-3	
A8. Special Training/Certifications			
a. Identifies any project personnel specialized training or certifications		Section 2.5	
b. Discusses how this training will be provided		Section 2.5	
c. Indicates personnel responsible for assuring training/certifications are satisfied		Section 2.5	
d. identifies where this information is documented		Section 2.5	
A9. Documentation and Records			
a. Identifies report format and summarizes all data report package information		Section 2.6.6	
b. Lists all other project documents, records, and electronic files that will be produced		Section 2.6	
c. Identifies where project information should be kept and for how long		Section 2.6.7	Long term project. Project information maintained indefinitely in GIS database.
d. Discusses back up plans for records stored electronically		Section 3.6	
e. States how individuals identified in A3 will receive the most current copy of the approved QA Project Plan, identifying the individual responsible for this		Section 2.5	
B. Data Generation/Acquisition			
B1. Sampling Process Design (Experimental Design)			
a. Describes and justifies design strategy, indicating size of the area, volume, or time period to be represented by a sample		Section 3.0	
b. Details the type and total number of sample types/matrix or test runs/trials expected and needed		Section 3.1	
c. Indicates where samples should be taken, how sites will be identified/located		Section 3.1	
d. Discusses what to do if sampling sites become inaccessible		Section 3.1.1.3	
e. Identifies project activity schedules such as each sampling event, times samples should be sent to the laboratory, etc.		Section 4.2 & Table 1	

f. Specifies what information is critical and what is for informational purposes only		Sections 2.6.2 & 2.6.7 Attachment F	
g. Identifies sources of variability and how this variability should be reconciled with project information		Sections 2.4.7, 3.3.2 & 4.1	
B2. Sampling Methods			
a. Identifies all sampling SOPs by number, date, and regulatory citation, indicating sampling options or modifications to be taken		Attachment A-1	
b. Indicates how each sample/matrix type should be collected		Attachment A-1	
c. If in situ monitoring, indicates how instruments should be deployed and operated to avoid contamination and ensure maintenance of proper data		N/A	
d. If continuous monitoring, indicates averaging time and how instruments should store and maintain raw data, or data averages		N/A	
e. Indicates how samples are to be homogenized, composited, split, or filtered, if needed		Attachment A-1	
f. Indicates what sample containers and sample volumes should be used		Attachment A-1	
g. Identifies whether samples should be preserved and indicates methods that should be followed		Attachment A-1	
h. Indicates whether sampling equipment and samplers should be cleaned and/or decontaminated, identifying how this should be done and by-products disposed of		Attachment A-1	
i. Identifies any equipment and support facilities needed		Attachment A-1	
j. Addresses actions to be taken when problems occur, identifying individual(s) responsible for corrective action and how this should be documented		Section 4.0 & Attachment A-1	
B3. Sample Handling and Custody			

a. States maximum holding times allowed from sample collection to extraction and/or analysis for each sample type and, for in-situ or continuous monitoring, the maximum time before retrieval of information		Section 5.2.2	
b. Identifies how samples or information should be physically handled, transported, and then received and held in the laboratory or office (including temperature upon receipt)		Section 3.1 Attachments A-1, A-2 & A-3	
c. Indicates how sample or information handling and custody information should be documented, such as in field notebooks and forms, identifying individual responsible		Section 2.6 Attachment A-1	
d. Discusses system for identifying samples, for example, numbering system, sample tags and labels, and attaches forms to the plan		Sections 3.1.1.5.1, 3.1.1.5.2, 3.1.2.3 & 3.1.2.5	
e. Identifies chain-of-custody procedures and includes form to track custody		Section 2.6.4 Attachment A-1	
B4. Analytical Methods			
a. Identifies all analytical SOPs (field, laboratory and/or office) that should be followed by number, date, and regulatory citation, indicating options or modifications to be taken, such as sub-sampling and extraction procedures		Section 3.2 Attachments A-2 & A-3	
b. Identifies equipment or instrumentation needed		Section 3.2 Attachments A-2 & A-3	
c. Specifies any specific method performance criteria		Attachments A-2 & A-3	
d. Identifies procedures to follow when failures occur, identifying individual responsible for corrective action and appropriate documentation		Section 4.1 Attachments A-2 & A-3	
e. Identifies sample disposal procedures		Attachments A-2 & A-3	
f. Specifies laboratory turnaround times needed		Not Specified	As needed to complete annual DSR and possible short turnaround time on occasion to meet RA schedule.

g. Provides method validation information and SOPs for nonstandard methods		Attachments A-2 & A-3	
B5. Quality Control			
a. For each type of sampling, analysis, or measurement technique, identifies QC activities which should be used, for example, blanks, spikes, duplicates, etc., and at what frequency		Section 3.3 Attachments A-2 & A-3	
b. Details what should be done when control limits are exceeded, and how effectiveness of control actions will be determined and documented		Section 4.1 Attachments A-2 & A-3	
c. Identifies procedures and formulas for calculating applicable QC statistics, for example, for precision, bias, outliers and missing data		Attachments A-2 & A-3	
B6. Instrument/Equipment Testing, Inspection, and Maintenance			
a. Identifies field and laboratory equipment needing periodic maintenance, and the schedule for this		Attachments A-1, A-2 & A-3	
b. Identifies testing criteria		Attachments A-1, A-2 & A-3	
c. Notes availability and location of spare parts		Attachments A-1, A-2 & A-3	
d. Indicates procedures in place for inspecting equipment before usage		Attachments A-1, A-2 & A-3	
e. Identifies individual(s) responsible for testing, inspection and maintenance		Attachments A-1, A-2 & A-3	
f. Indicates how deficiencies found should be resolved, re-inspections performed, and effectiveness of corrective action determined and documented		Section 4.1 Attachments A-1, A-2 & A-3	
B7. Instrument/Equipment Calibration and Frequency			
a. Identifies equipment, tools, and instruments that should be calibrated and the frequency for this calibration		Attachments A-1, A-2 & A-3	

b. Describes how calibrations should be performed and documented, indicating test criteria and standards or certified equipment		Attachments A-2 & A-3	
c. Identifies how deficiencies should be resolved and documented		Section 4.1 Attachments A-1, A-2 & A-3	
B8. Inspection/Acceptance for Supplies and Consumables			
a. Identifies critical supplies and consumables for field and laboratory, noting supply source, acceptance criteria, and procedures for tracking, storing and retrieving these materials		Section 3.5 Attachments A-1, A-2 & A-3	
b. Identifies the individual(s) responsible for this		Section 4.1 Attachments A-1, A-2 & A-3	
B9. Use of Existing Data (Non-direct Measurements)			
a. Identifies data sources, for example, computer databases or literature files, or models that should be accessed and used		Section 2.4.2	
b. Describes the intended use of this information and the rationale for their selection, i.e., its relevance to project		Sections 2.4.2, 2.4.6 & 3.1	
c. Indicates the acceptance criteria for these data sources and/or models		Sections 2.4.2, 2.4.6 & 3.1	
d. Identifies key resources/support facilities needed		Attachments A-1, A-2 & A-3	
e. Describes how limits to validity and operating conditions should be determined, for example, internal checks of the program and Beta testing		Sections 3.3 & 5.0 Attachments A-2 & A-3	
B10. Data Management			
a. Describes data management scheme from field to final use and storage		Sections 3.0, 4.0 & 5.0	

b. Discusses standard record-keeping and tracking practices, and the document control system or cites other written documentation such as SOPs		Sections 2.6, 3.0 & 4.0	
c. Identifies data handling equipment/procedures that should be used to process, compile, analyze, and transmit data reliably and accurately		Sections 2.6.5, 3.6	
d. Identifies individual(s) responsible for this		Section 5.1.1	
e. Describes the process for data archival and retrieval		Section 3.6	
f. Describes procedures to demonstrate acceptability of hardware and software configurations		Section 3.6	
g. Attaches checklists and forms that should be used		Section 3.6	
C. Assessment and Oversight			
C1. Assessments and Response Actions			
a. Lists the number, frequency, and type of assessment activities that should be conducted, with the approximate dates		Section 4.0	
b. Identifies individual(s) responsible for conducting assessments, indicating their authority to issue stop work orders, and any other possible participants in the assessment process		Section 4.0	
c. Describes how and to whom assessment information should be reported		Section 4.0	
d. Identifies how corrective actions should be addressed and by whom, and how they should be verified and documented		Section 4.0	
C2. Reports to Management			
a. Identifies what project QA status reports are needed and how frequently		Section 4.3	
b. Identifies who should write these reports and who should receive this information		Section 4.3	
D. Data Validation and Usability			
D1. Data Review, Verification, and Validation			
Describes criteria that should be used for accepting, rejecting, or qualifying project data		Section 5.0	
D2. Verification and Validation Methods			

a. Describes process for data verification and validation, providing SOPs and indicating what data validation software should be used, if any		Section 5.1	
b. Identifies who is responsible for verifying and validating different components of the project data/information, for example, chain-of-custody forms, receipt logs, calibration information, etc.		Section 5.1	
c. Identifies issue resolution process, and method and individual responsible for conveying these results to data users		Section 5.1	
d. Attaches checklists, forms, and calculations		Section 5.0 Attachment F	
D3. Reconciliation with User Requirements			
a. Describes procedures to evaluate the uncertainty of the validated data		Section 5.0	
b. Describes how limitations on data use should be reported to the data users		Section 5.0	

APPENDIX F

CS OU STATUS MAPS (LEAD LEVELS)

DATE: 8/6/2015

PREPARED FOR: Atlantic Richfield Company
A BP affiliated company

BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 1 - CS OU OVERVIEW

N
W E
S

0 1,500 3,000 6,000 9,000 12,000 Feet

Notes:
1.) Map data compiled by DJ&A, P.C. from the Atlantic Richfield Co. GIS database. The user of this data assumes responsibility to verify usability for their purposes.

2.) Parcel Boundaries do not represent a legal survey. They are intended for reference use only.

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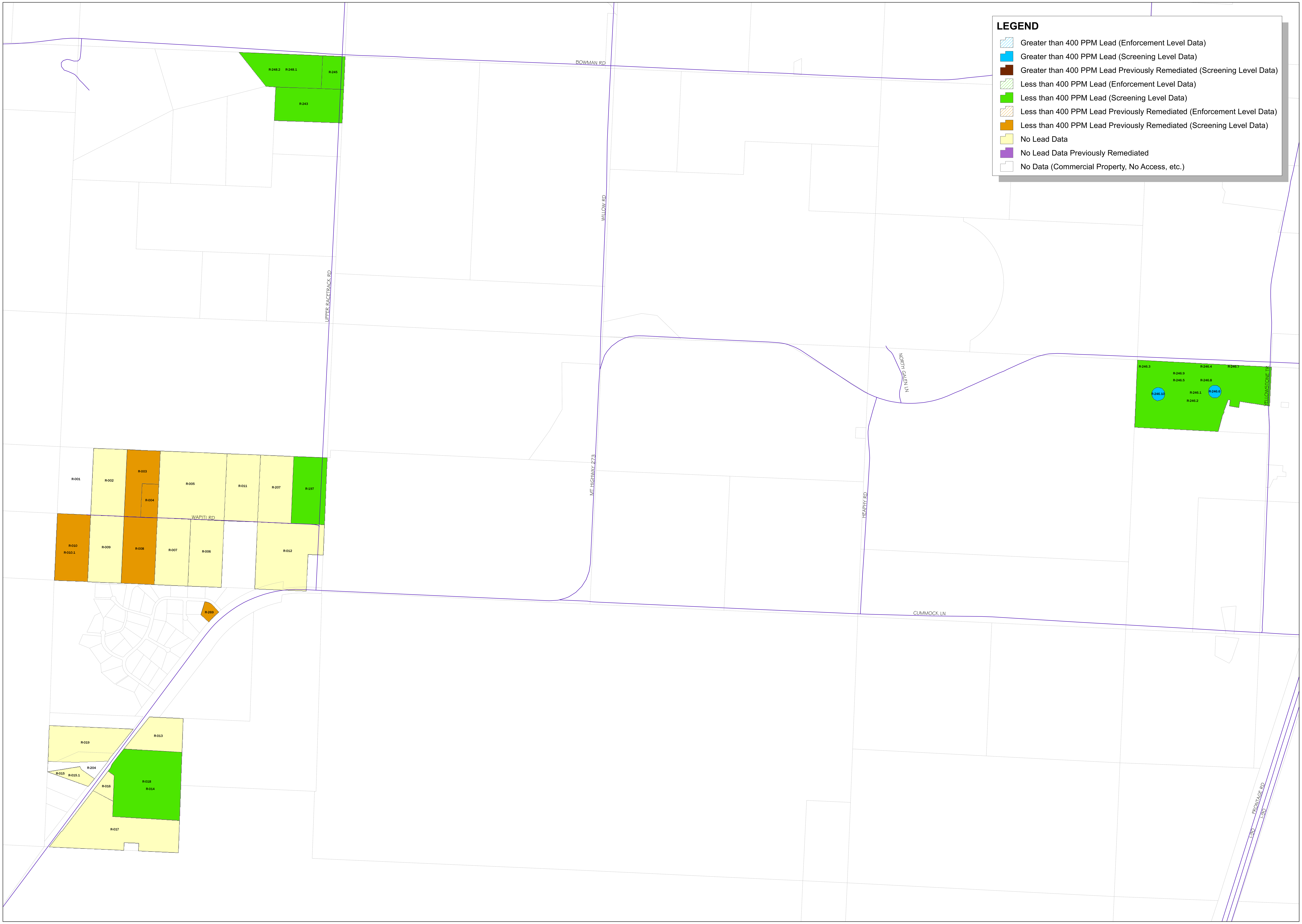

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BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 2 - WEST GALEN - NORTHEAST SECTION

N W E S

0 300 600 1,200 1,800 2,400 Feet

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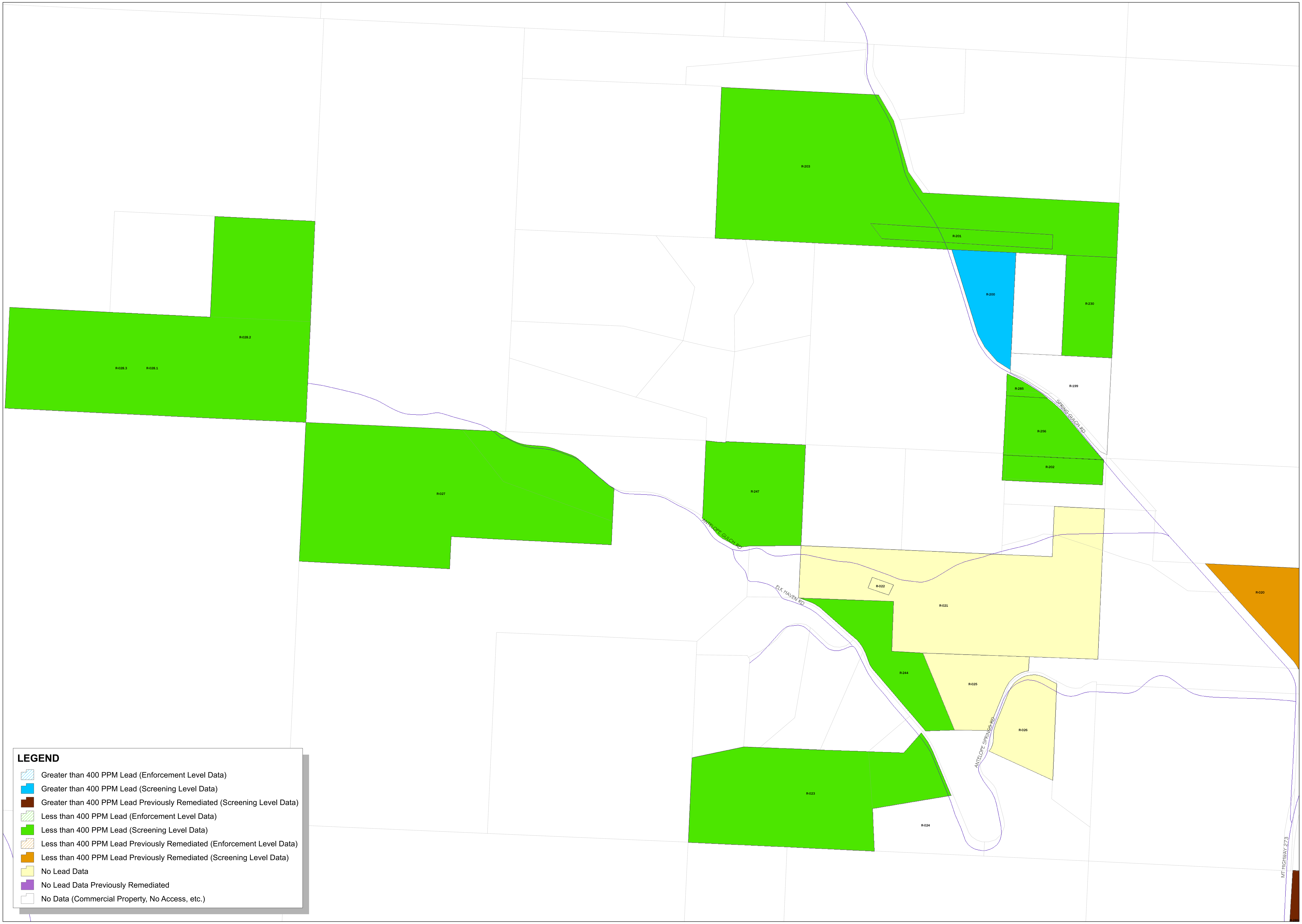

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 3 - WEST GALEN - NORTHWEST SECTION

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0 250 500 1,000 1,500 2,000 Feet

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A BP affiliated company

BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 4 - ANACONDA - WEST VALLEY

N W E S

Notes:
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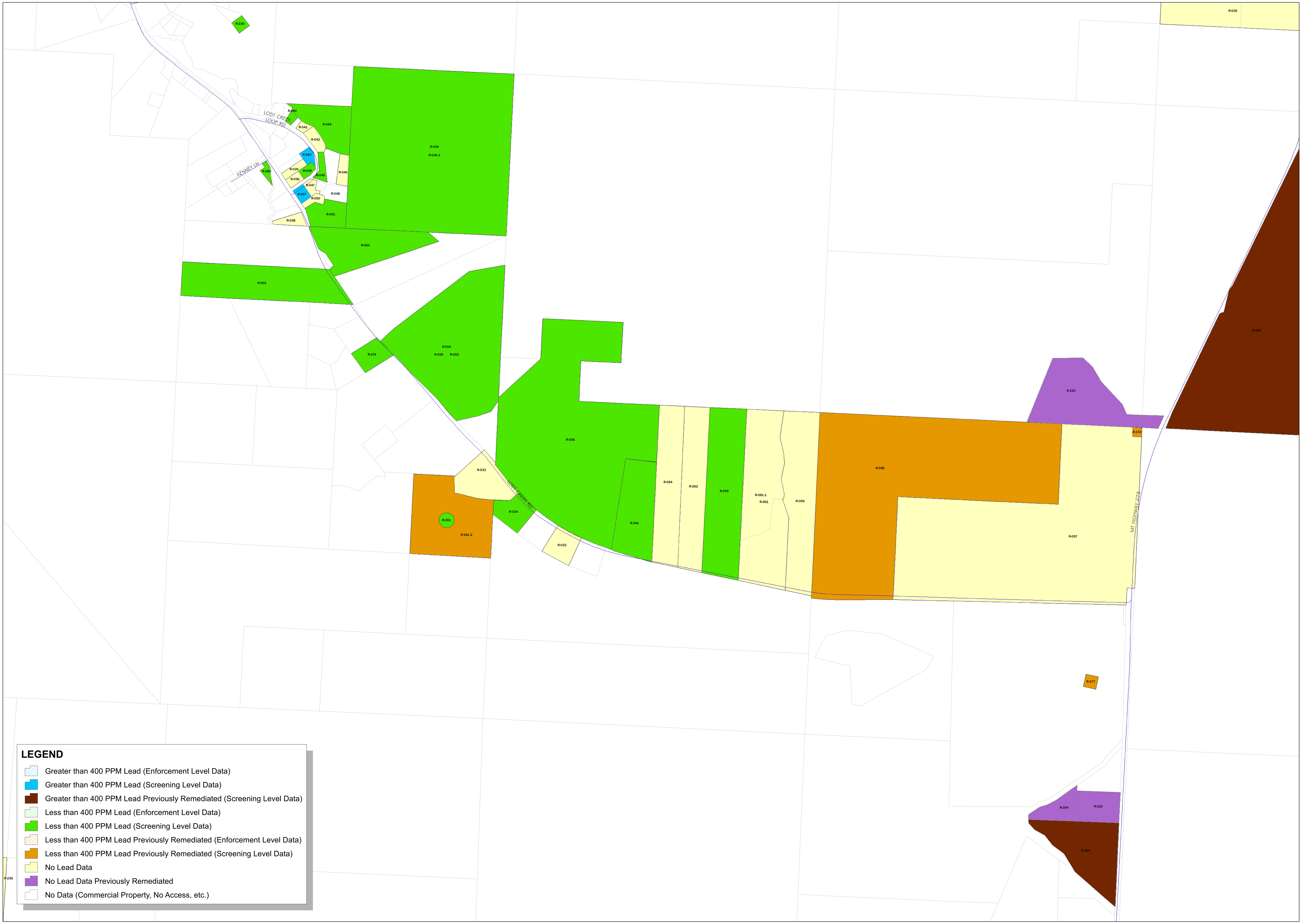

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BY: DJ&A, P.C. CONSULTING ENGINEERS & LAND SURVEYORS

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 5 - WEST GALEN - SOUTHWEST SECTION

N W E S

0 250 500 1,000 1,500 2,000 Feet

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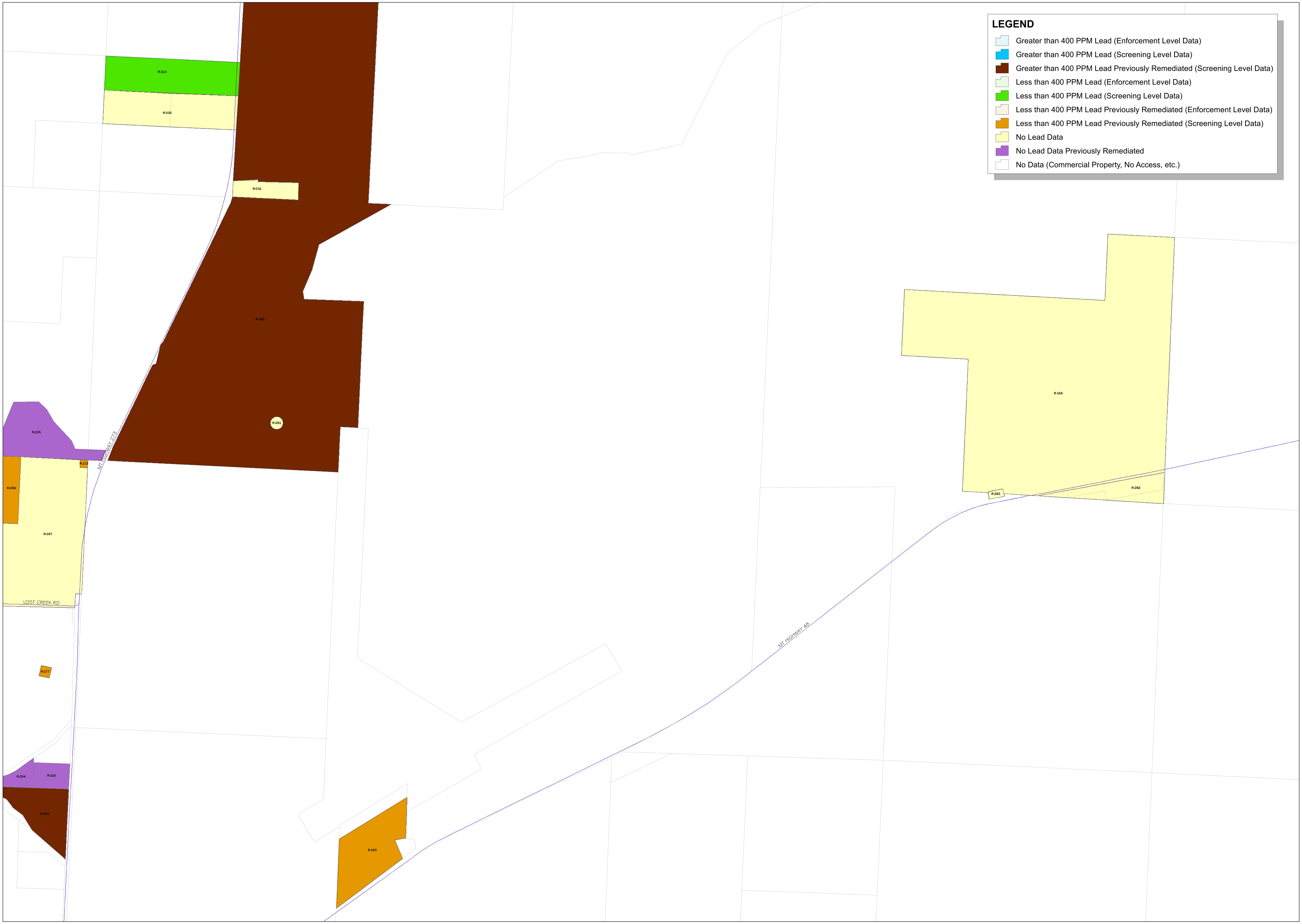

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 6 - WEST GALEN - SOUTHEAST SECTION

N
W E
S

0 300 600 1,200 1,800 2,400
Feet

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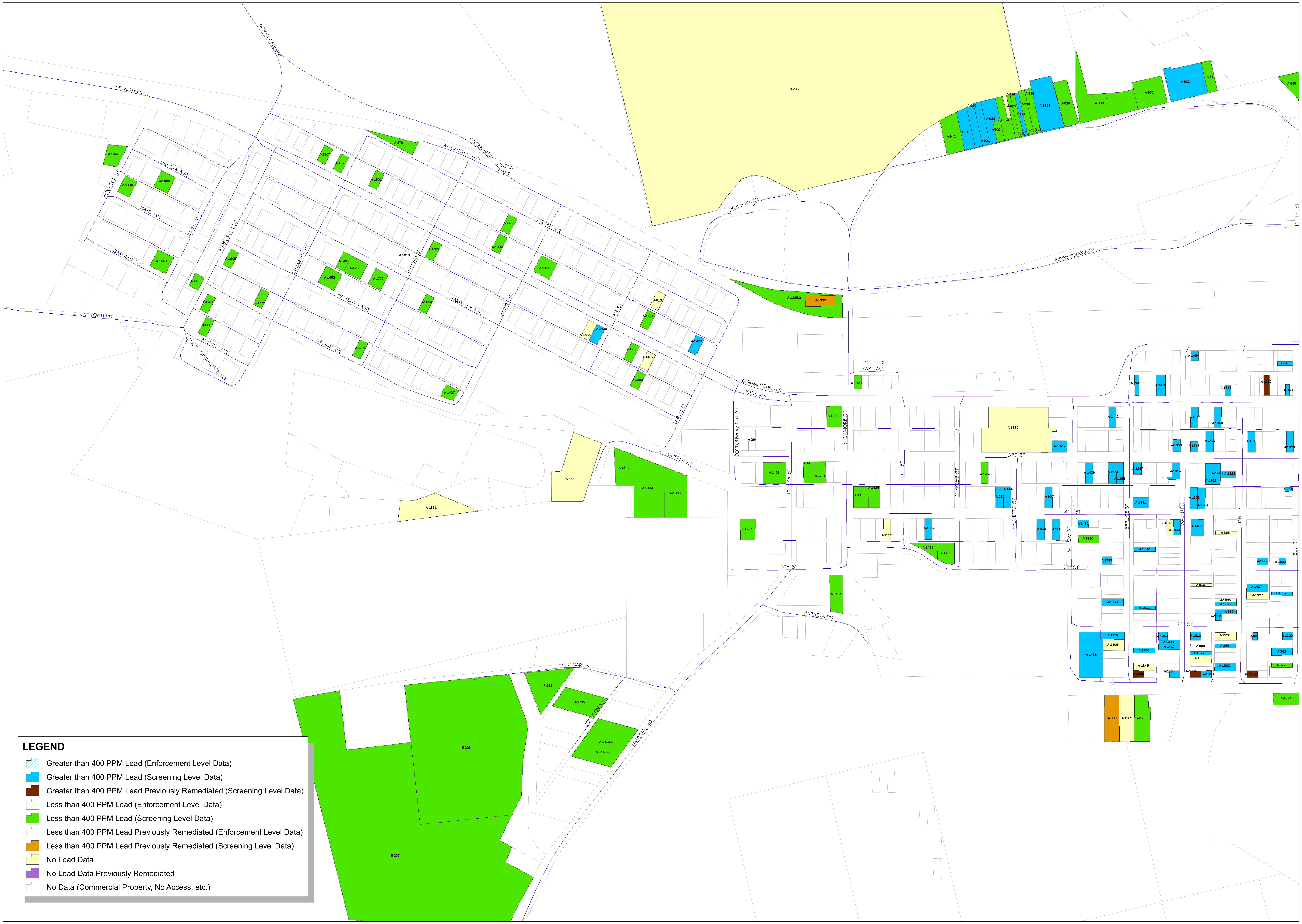

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 7 - ANACONDA - NORTHWEST SECTION

N E S W

0 100 200 400 600 800 Feet

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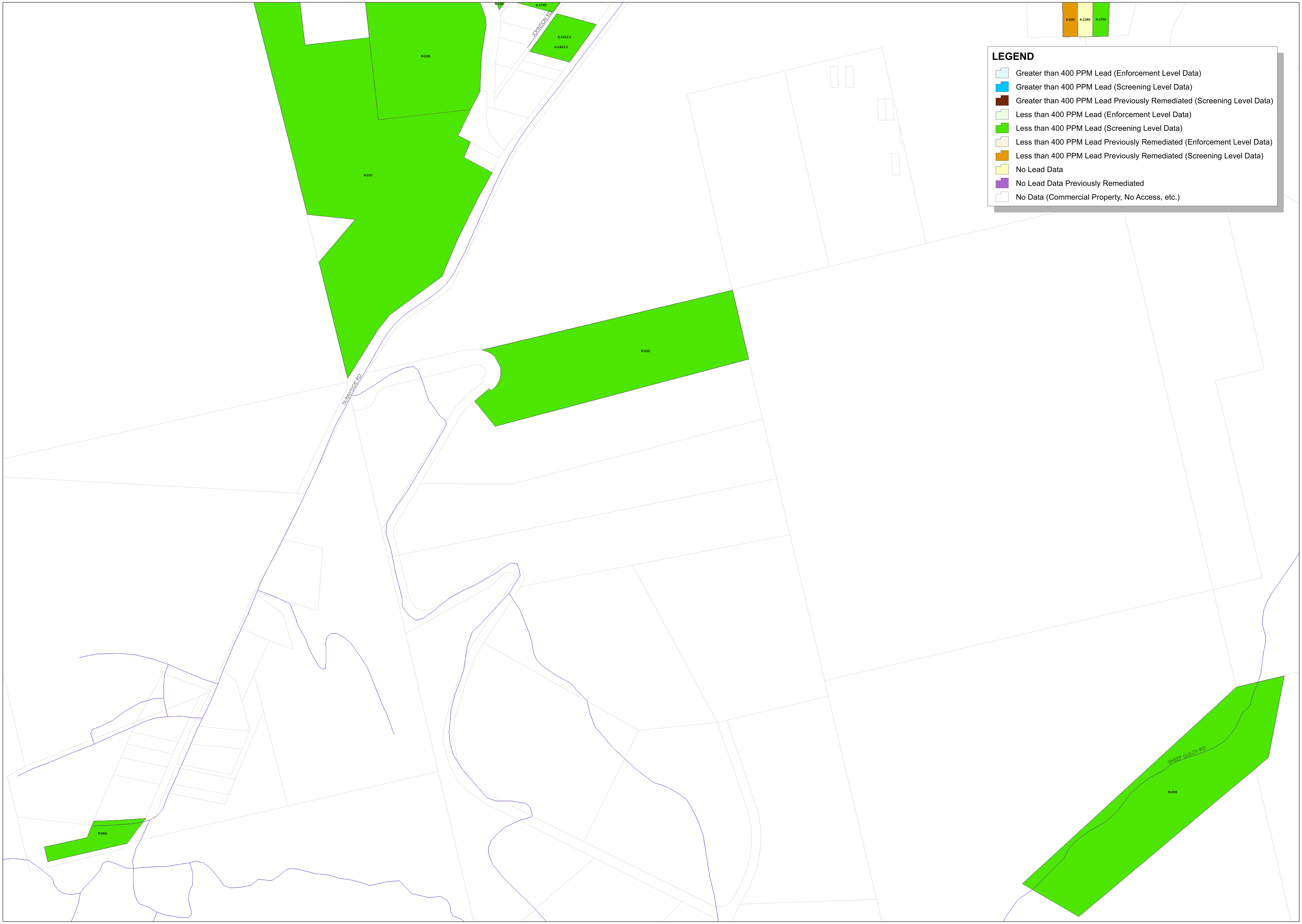

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 8 - ANACONDA - SOUTHWEST SECTION

0 100 200 400 600 800 Feet

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DATE: 8/6/2015

PREPARED FOR: **Atlantic Richfield Company**
A BP affiliated company

BY: DJ&A, P.C. CONSULTING ENGINEERS & LAND SURVEYORS
PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 9 - ANACONDA - NORTH CENTRAL SECTION

N E S W

0 50 100 200 300 400 Feet

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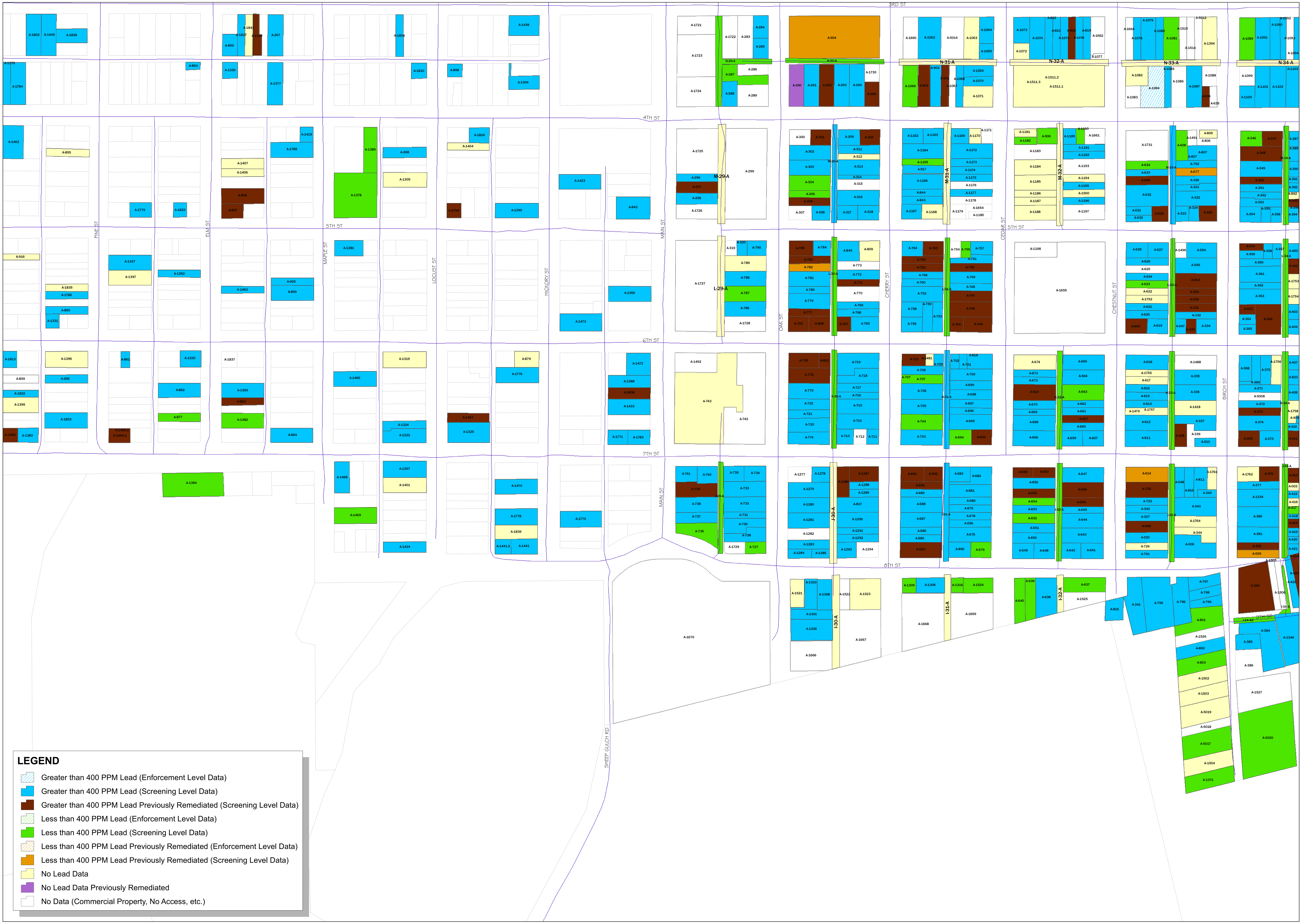

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 10 - ANACONDA - SOUTH CENTRAL SECTION

N E S W

0 50 100 200 300 400 Feet

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DATE: 8/6/2015

0 50 100 200 300 400 Feet

PREPARED FOR: **Atlantic Richfield Company**
A BP affiliated company
bp

BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 11 - ANACONDA - NORTHEAST SECTION

N E W S

Notes:
1.) Map data compiled by DJ&A, P.C. from the Atlantic Richfield Co. GIS database. The user of this data assumes responsibility to verify usability for their purposes.

2.) Parcel Boundaries do not represent a legal survey. They are intended for reference use only.

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DATE: 8/6/2015

PREPARED FOR: **Atlantic Richfield Company**
A BP affiliated company

BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 12 - ANACONDA - SOUTHEAST SECTION

Notes:
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DATE: 8/6/2015

PREPARED FOR: Atlantic Richfield Company
A BP affiliated company

BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 13 - WEST ASPEN HILLS

N W E S

0 200 400 800 1,200 1,600 Feet

Notes:
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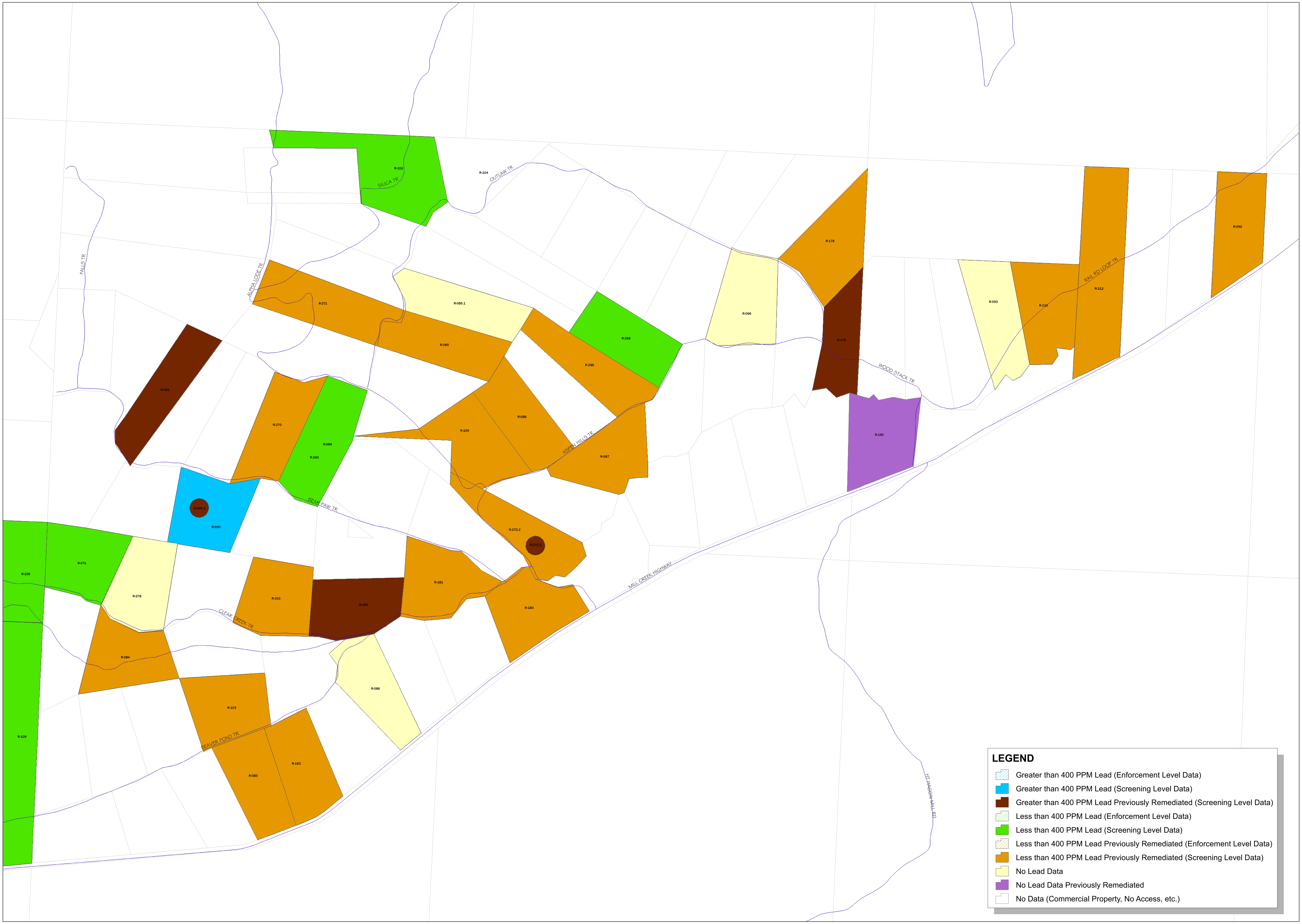

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PREPARED FOR: Atlantic Richfield Company
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BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

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CS OU STATUS MAP (LEAD LEVELS)
FIGURE 14 - EAST ASPEN HILLS

N W E S

0 200 400 800 1,200 1,600 Feet

Notes:
1.) Map data compiled by DJ&A, P.C. from the Atlantic Richfield Co. GIS database. The user of this data assumes responsibility to verify usability for their purposes.

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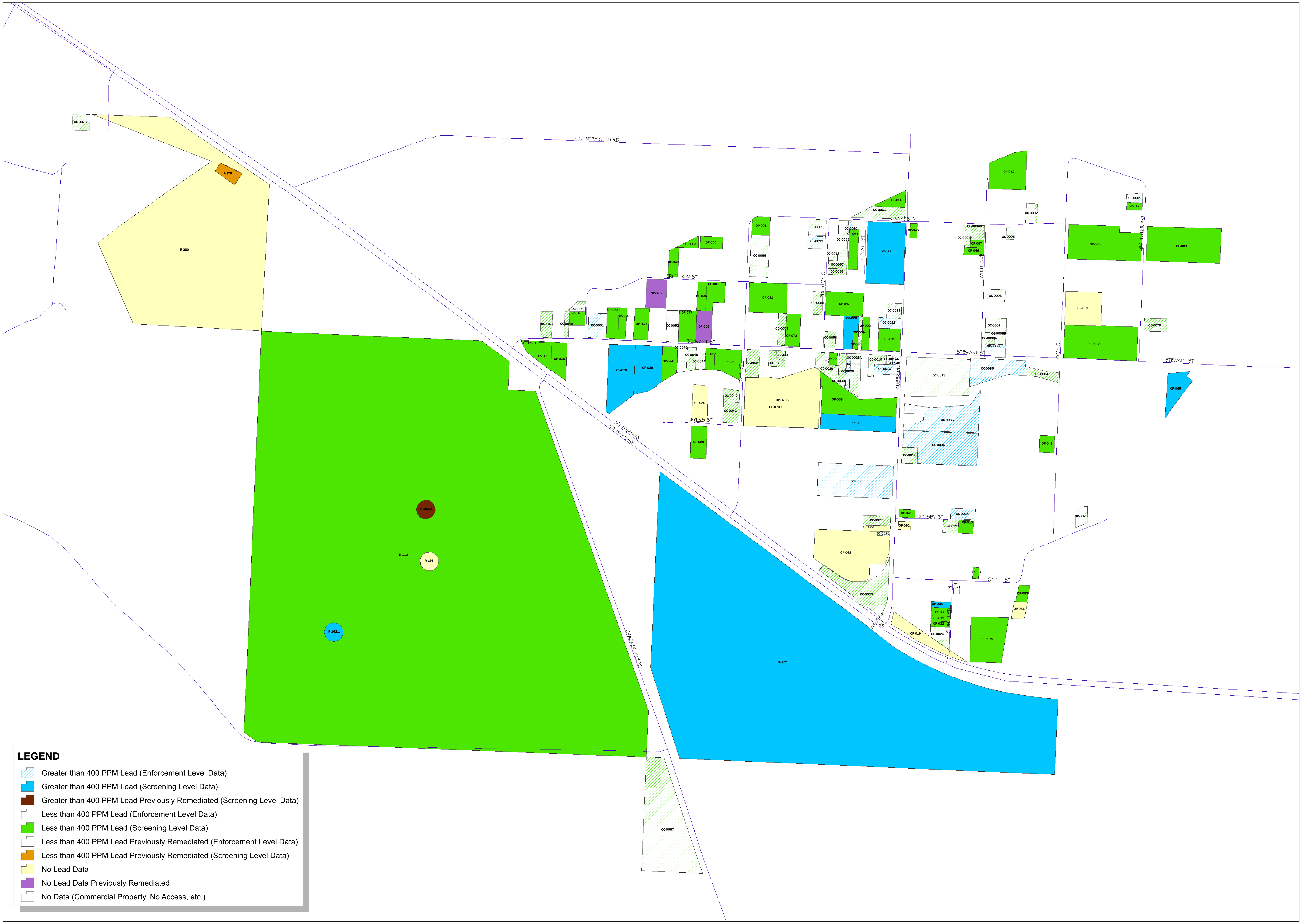

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PREPARED FOR: **Atlantic Richfield Company**
A BP affiliated company

BY: DJ&A, P.C. CONSULTING ENGINEERS & LAND SURVEYORS
PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 15 - OPPORTUNITY

N W E S

0 200 400 800 1,200 1,600 Feet

Notes:
1.) Map data compiled by DJ&A, P.C. from the Atlantic Richfield Co. GIS database. The user of this data assumes responsibility to verify usability for their purposes.

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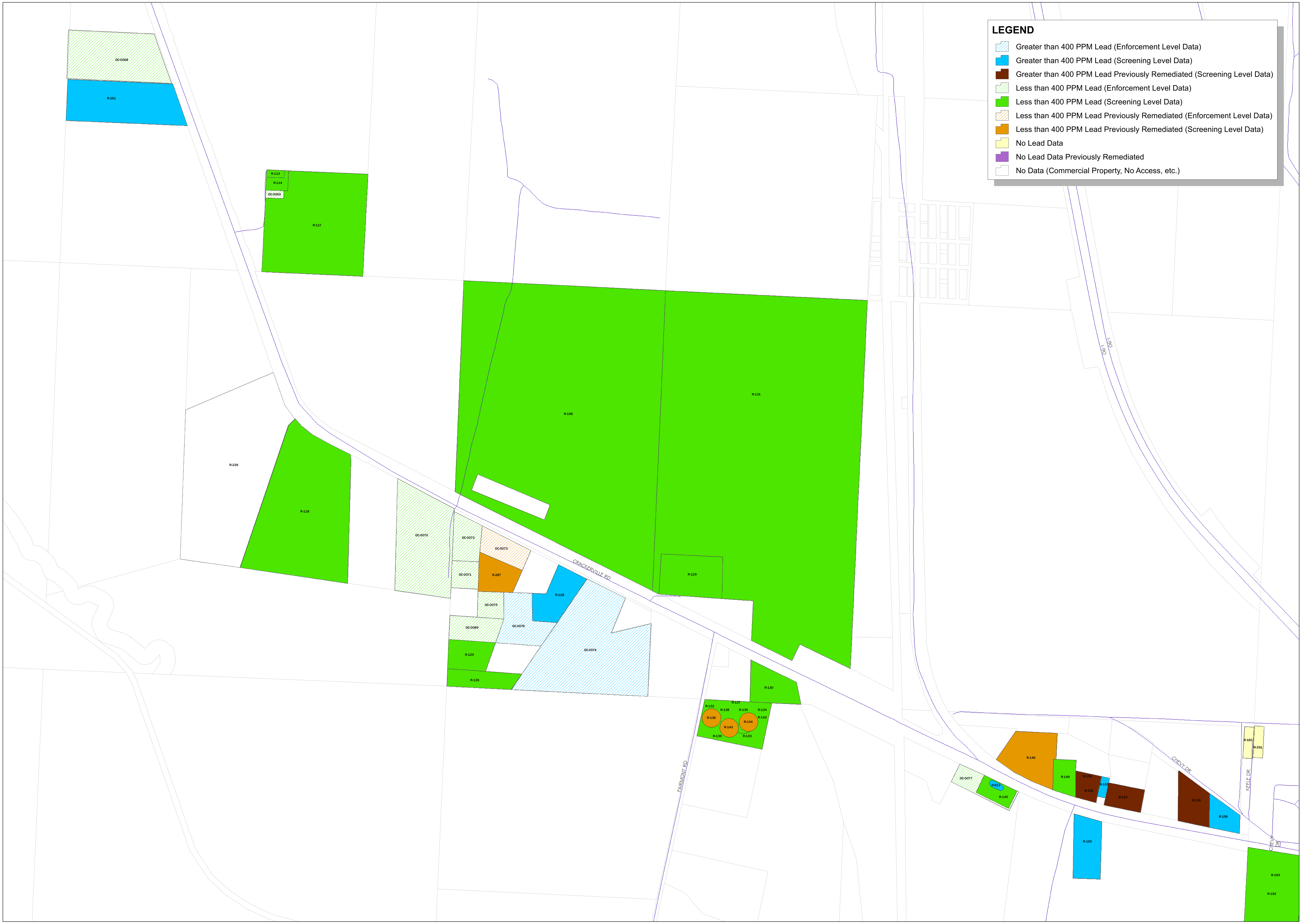

DATE: 8/6/2015

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BY:

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 16 - WEST CRACKERVILLE

N
W E
S

0 200 400 800 1,200 1,600 Feet

Notes:
1.) Map data compiled by DJ&A, P.C. from the Atlantic Richfield Co. GIS database. The user of this data assumes responsibility to verify usability for their purposes.

2.) Parcel Boundaries do not represent a legal survey. They are intended for reference use only.

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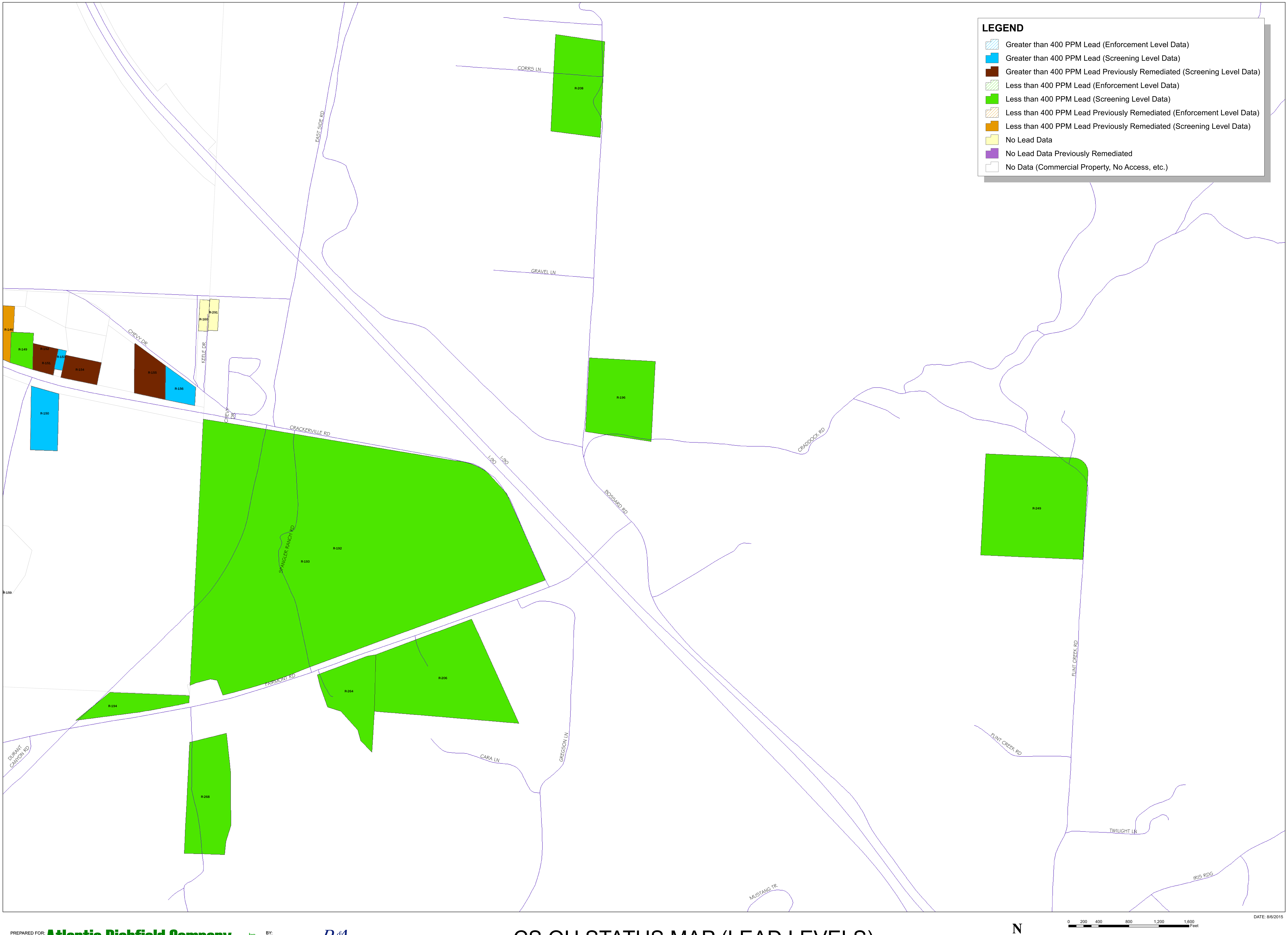

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BY: DJ&A, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
3203 Russell Street,
Missoula, Montana 59801
Phone (406) 721-4320
Fax (406) 549-6371
www.djanda.com

PIONEER TECHNICAL SERVICES, INC.

CS OU STATUS MAP (LEAD LEVELS)
FIGURE 17 - EAST CRACKERVILLE

Notes:
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APPENDIX G

CS OU PERFORMANCE STANDARDS

COMMUNITY SOILS OPERABLE UNIT REMEDIAL ACTION PERFORMANCE STANDARDS/ARARs COMPLIANCE PLAN

INTRODUCTION

This Appendix to each of the Community Soils Operable Unit (Community Soils OU) Remedial Action Work Plans (Residential Soils and Railroad Beds) identifies Performance Standards for remedial design for the Community Soils OU of the Anaconda Smelter National Priorities List Site, evaluates how the design will address the performance standards and clarifies the extent to which the ARARs identified in Appendix A of the September 25, 1996 Community Soils OU Record of Decision (ROD) apply to the remedial design to be implemented at the Community Soils OU.

The Anaconda Regional Water, Waste and Soils ("ARWW&S") OU is intended to be the final, comprehensive OU for the Anaconda Smelter NPL Site, addressing all issues remaining that were not addressed by the Old Works/East Anaconda Development Area OU, the Flue Dust OU, the Arbiter/Beryllium OU, and the Community Soils OU. As such, the Community Soils OU ROD does not require remediation of ground or surface water and does not require compliance with water ARARs.

Only the substantive provisions of the requirements identified below are Performance Standards. No permits are anticipated for the Community Soils OU remedial action in accordance with Section 121(e) of CERCLA, 42 U.S.C. § 9621(e). Certain substantive requirements of permits will be identified in the Work Plans and the remedial design and will be applied in the remedial action. Note that a number of the Administrative Rules for Montana that were identified in Appendix A of the Community Soils OU ROD were subsequently renumbered. In the following Performance Standards discussion, the original citation is provided, along with a parenthetical notation of the present citation for the particular regulation.

I. CONTAMINANT SPECIFIC ARARs

Federal and State Groundwater and Surface Water ARARs.

In the Identification of ARARs for the Community Soils OU ROD, the Agencies acknowledged that final remediation of groundwater and surface water is not within the scope of the Community Soils OU, but instead is to be addressed by the ARWW&S OU remedial action. The ROD for the Community Soils OU does not require remediation of ground or surface water and does not require compliance with water ARARs, but the Agencies nevertheless identified certain ground and surface water quality requirements for two purposes: (1) to prohibit degradation of ground or surface water by conduct of the Community Soils OU remedial action, and (2) to achieve consistency with the ARWW&S OU remedial action which does require compliance with water ARARs.

Remedial action activities for the residential soils component of the Community Soils OU remedial action will not occur in or near surface water bodies. Limited remedial action activities for the railroad bed component of the Community Soils OU remedial action plan (i.e., soils removal work along the North Side Trail) may be conducted in close proximity to portions Warm Springs Creek. Consistency with the ARWW&S OU remedial action and protection of water resources during conduct of the Community Soils OU remedial action will be achieved through the use of best management practices to minimize releases of contaminants from railroad bed materials to Warm Springs Creek. Such measures will avoid violation of the following requirements for conduct of the Community Soils OU remedial action activities:

The Federal Clean Water Act, 33 U.S.C. §§ 1251 et seq., ARM §§ 16.20.601 et seq. (renumbered as ARM §§ 17.30.601 et seq.) – establishing Montana's Water-Use Classification system. Under ARM § 16.20.604 (renumbered as ARM § 17.30.607), Warm Springs Creek has been classified B-1. Certain of the B-1 standards, codified at ARM § 16.20.623 (renumbered as ARM § 17.30.628), as well as Montana's nondegradation requirements, were identified by the Agencies.

Surface and Groundwater Quality Requirements, Montana Water Quality Act, MCA §§ 75-5-101 et seq., and implementing regulations.

The Agencies included the following requirements in the Identification of ARARs for the Community Soils OU remedial action:

MCA § 75-5-303 – providing that existing uses of state waters and the level of water quality necessary to protect those uses must be maintained.;

MCA § 75-5-605 – prohibiting the causing of pollution of any state waters or the placing of wastes where they will cause pollution of any state waters

Surface Water

ARM § 16.20.618 (renumbered as ARM § 17.30.623) – detailing the B-1 classification requirements

ARM § 16.20.633 (renumbered as ARM § 17.30.637) – prohibiting discharges containing substances which will settle, create floating debris, scum, or film, produce odors, create colors or other conditions creating a nuisance, or create concentrations or combinations of materials which are toxic, or create conditions which produce undesirable aquatic life

ARM § 16.20.708 (renumbered as ARM § 17.30.705) – requiring maintenance of existing and anticipated uses of surface water and water quality to support the B-1 classification

General Discharge Permit for Storm Water Associated with Construction Activity. Permit No. MTR100000 (November 17, 1992) – requiring the implementation of best management practices to address stormwater runoff from construction activities

Each of the water quality requirements outlined above will be addressed through the use of best management practices, which will be employed where necessary to prevent erosion or sediment loading to surface waters. Contaminated soils that will be excavated and disposed elsewhere will not be placed where they will cause pollution of any state waters.

Point of Compliance: Within the area where remedial action activities are conducted.
Time of Compliance: During implementation of the Community Soils OU remedial action. The Community Soils OU remedial action activities will employ best management practices to prevent degradation of existing surface water quality.

Groundwater. The Agencies included the following requirements in the Identification of ARARs for the Community Soils OU remedial action:

ARM §§ 16.20.1002 and .1003 (renumbered ARM §§ 17.30.1002 and .1003) – establishing Class I groundwater standards

ARM § 16.20.1011 (renumbered ARM § 17.30.1011) – providing that any groundwater whose existing quality is higher than the standard for its classification generally must be maintained at that high quality

The remedial action activities to be conducted to implement the Community Soils OU ROD are not anticipated to have an adverse impact on groundwater quality. Therefore, this action meets this standard.

Federal and State Air Quality Requirements

Air quality standards currently are being attained within the Community Soils OU. Remedial action activities will avoid violations of the following requirements by implementing best management practices such as standard dust construction suppression methods including wetting down loose soils:

National Ambient Air Quality Standards, 40 CFR § 50.6 (PM-10) 40 CFR § 50.12 (lead) – establishing standards for PM-10 and lead emissions to air. Corresponding state standards are found at ARM § 16.8.815 (renumbered ARM § 17.8.222) (lead) and ARM § 16.8.821 (renumbered ARM § 17.8.223) (PM-10).

Montana Ambient Air Quality Regulations, ARM §§ 16.8.807, .809, .815, .818, and .821 (renumbered ARM §§ 17.8.204, .206, .222, .220, and .223).

ARM § 16.8.807 (17.8.204) – establishing sampling, data collection and analytical requirements to ensure compliance with ambient air quality standards.

ARM § 16.8.809 (17.8.206) – establishing sampling, data collection, recording, and analysis to ensure compliance with ambient air quality standards.

ARM § 16.8.815 (17.8.222) – prohibiting lead emissions to ambient air from exceeding a 90-day average of 1.5 micrograms per cubic liter of air.

ARM § 16.8.818 (17.8.220) – prohibiting settled particulate matter from exceeding a 30-day average of 10 grams per square meter.

ARM § 16.8.821 (17.8.223) – prohibiting PM-10 concentrations in ambient air from exceeding a 24-hour average of 150 micrograms per cubic meter of air and an annual average of 50 micrograms per cubic meter of air. Standard construction practices, such as periodic wetting, will ensure compliance with identified ARARs.

Point of Compliance: At the boundary of the Community Soils OU.
Time of Compliance: During conduct of remedial action activities.

II. LOCATION SPECIFIC REQUIREMENTS

Historic and cultural resource preservation and mitigation requirements. National Historic Preservation Act, 16 U.S.C. §§ 470 et seq., 40 CFR § 6.301(b), 36 CFR Part 800 ("NHPA") and Historic Sites, Buildings and Antiquities Act, 16 U.S.C. §§ 461 et seq.; 40 CFR § 6.310(a). Compliance with the NHPA requirements has been attained through the Regional Historic Preservation Plan as implemented pursuant to the Second Programmatic Agreement with the National Advisory Council on Historic Preservation, EPA, Anaconda/Deer Lodge County and others.

Point of Compliance: At the location of identified existing historic resources that may be adversely impacted by the remedial action activities.
Time of Compliance: During conduct of the remedial action activities.

Endangered Species Act, 16 U.S.C. § 1531, 40 CFR § 6.302(h), 50 CFR Parts 17 and 402. As part of on-going site investigations, ARCO completed a report, *Anaconda Smelter NPL Site, Wetlands and Threatened/Endangered Species Inventory with Determination of Effective Wetland Area* (ARCO 1999c) which noted that the following threatened or endangered animal species are present in the Anaconda area: bald eagles and peregrine falcons. Additionally, the Montana Natural Heritage Program database indicates that Preble's shrew has been observed on site.

While Bull Trout have been identified in the upper reaches of Warm Springs Creek, based upon the available information and investigations to date, EPA in consultation with the U.S. Fish and Wildlife Service, does not anticipate that such threatened species will be affected by the remedial action at the Community Soils OU. It is therefore anticipated that no further actions will be required for compliance with these requirements. In the event that bald eagles or peregrine falcon are identified as present within the Community Soils OU during remedial design, and it is determined that such species may be adversely impacted by the Community Soils remedial action, appropriate notification, consultation and mitigative measures will be developed and followed, as necessary, in accordance with the substantive provisions of the above-referenced requirements. It is anticipated that the use of standard engineering and construction practices will provide appropriate mitigative measures.

Point of Compliance: Within the area of remedial action activities.
Time of Compliance: During conduct of remedial action activities.

Floodplain Management, 40 CFR § 6.302(b) and Executive Order No. 11988. These require that actions be taken to avoid, to the extent possible, adverse effects associated with direct or indirect development of a floodplain, or to minimize adverse impacts if no practicable alternative exists. Limited remedial action activities may be conducted within the floodplain. Those activities may consist of the limited soils removal, relocation, and capping in a discrete location where elevated arsenic has been identified in a former railbed along Warm Springs Creek. No development within any floodplain within the Community Soils OU is planned as part of the remedial action activities.

Point of Compliance: Where remedial action activities are conducted within the floodplain.
Time of Compliance: During conduct of remedial action activities.

State of Montana Floodplain and Floodway Management Act and Regulations.

MCA § 76-5-402, ARM 36.15.701 and 702. These provisions specify uses allowed in the floodplain, excluding the floodway, and allow residential, commercial, or industrial structures meeting certain minimum standards including those relating to placement of fill, roads, and flood-proofing. No structures will be constructed within a floodplain or a floodway as part of the Community Soils OU remedial action.

ARM 36.15.602(5), 605, and 703. Solid and hazardous waste disposal and storage of toxic, flammable, hazardous, or explosive materials are prohibited anywhere in floodways or floodplains. No storage or disposal of any materials will occur within floodways or floodplains as part of the remedial action activities for the Community Soils OU. Therefore, no further action is required to comply with this requirement.

ARM 36.15.606. Requires compliance with standards for levees, floodwalls, and riprap. No levees or floodwalls will be constructed as part of the Community Soils OU remedial action; if riprap material is used in locations where soils are removed along Warm Springs Creek, it will meet requisite standards.

ARM 36.15.701(3)(c) and (d). Roads, streets, highways and rail lines must be designed to minimize increases in flood heights. Structures and facilities for liquid or solid waste treatment and disposal must be flood-proofed to ensure that no pollutants enter flood waters and may be allowed and approved only in accordance with regulations. No physical improvements will be constructed within a floodplain or floodway as part of the Community Soils OU remedial action. Therefore, no further action is required to comply with this requirement.

Point of Compliance: Within floodplains or floodways where remedial action activities occur.
Time of Compliance: During conduct of remedial action activities.

III. ACTION SPECIFIC REQUIREMENTS

Federal and State RCRA Subtitle D Requirements. In the Identification of ARARs appended to the Community Soils OU ROD, the Agencies stated: "It is not expected that the solid waste requirements identified herein will be performance standards or final ARARs for the Community Soils OU. Some of these will be considered relevant and appropriate for the temporary storage or management of solid waste until final closure under the ARWW&S OU."

40 CFR § 264.257 (incorporated by reference in Montana under ARM § 16.44.702, renumbered ARM § 17.54.702) Criteria for Classification of Solid Waste Disposal Facilities and Practices. The Identification of ARARs appended to the Community Soils OU ROD listed the following requirements.

40 CFR § 257.3-1 – prohibiting washout of solid waste in facilities in a floodplain posing a hazard to human life, wildlife, or land or water resources.

40 CFR § 257.3-2 – prohibiting solid waste disposal facilities from contributing to the taking of endangered species or the endangering of critical habitat of endangered species.

40 CFR § 257.3-3 – prohibiting solid waste disposal facilities from causing a discharge of pollutants, dredged or fill material, into waters of the United States in violation of sections 402 and 404 of the Clean Water Act, and from causing nonpoint source pollution.

40 CFR § 257.3-4 – prohibiting solid waste disposal facilities from contaminating an underground source of drinking water beyond the solid waste boundary or beyond an alternative boundary specified in accordance with this section.

40 CFR § 257.3-8(d) – requiring control of access to a solid waste disposal facility so as to prevent exposure of the public to potential health and safety hazards at the site.

The Community Soils OU remedial action will not result in the creation of any new solid waste disposal facilities. Soils that are excavated for disposal will be relocated to the Opportunity Ponds Waste Management Area, which is governed by the ARWW&S OU ROD.

Point of Compliance: Within the boundaries of the Opportunity Ponds Waste Management Area.

Time of Compliance: At the completion of ARWW&S OU RD/RA activities for the Opportunity Ponds Waste Management Area.

State of Montana Solid Waste Requirements. The Identification of ARARs appended to the Community Soils OU ROD listed the following State solid waste requirements:

<u>ARM § 16.14.523 (renumbered ARM § 17.50.523)</u> – requiring solid waste to be transported in such a manner as to prevent its discharge, dumping, spilling or leaking from the transport vehicle.

<u>ARM § 17.50.505(1)</u> – requiring facilities for the treatment, storage or disposal of solid waste to: (1) be located where a sufficient acreage of suitable land is available for solid waste management; (2) not be located in a 100-year flood plain; (3) be located only in areas which will prevent the pollution of ground and surface waters and public and private water supply systems; (4) be located to allow for reclamation and reuse of the land; (e) have drainage structures installed where necessary to prevent surface runoff from entering waste management areas; and (f) be limited to Class III disposal facilities, where underlying geological formations contain rock fractures or fissures which may lead to pollution of the ground water or areas in which springs exist that are hydraulically connected to a proposed disposal facility.

<u>ARM § 17.50.505(2)</u> – specifying standards for solid waste management facilities, including the requirements that Class II landfills must confine solid waste and leachate to the disposal facility.

<u>ARM § 17.50.212</u> – prohibiting dumping or leaving any debris or refuse upon or within 200 yards of any highway, road, street, or alley of the state or other public property, or on privately owned property where hunting, fishing, or other recreation is permitted.

<u>ARM § 17.50.506</u> – specifying design requirements for landfills, and prohibiting exceedances of MCLs.

<u>ARM § 17.50.513</u> – specifying general operational and maintenance and design requirements including run-on and run-off control systems, fencing, and point and nonpoint source discharge in violation of Clean Water Act.

<u>ARM § 17.50.530 and 531</u> – establishing post-closure care requirements for Class II landfills.

Materials that are excavated and transported to the Opportunity Ponds Waste Management Area will be contained in such a manner as to prevent their discharge, dumping, spilling or leaking from the transport vehicle. The materials that will be excavated during conduct of the Community Soils OU remedial action will be transported to the Opportunity Ponds Waste Management Area. No new waste disposal facilities will be constructed as part of the Community Soils OU remedial action. The Opportunity Ponds Waste Management Area is governed by the ARWW&S OU ROD. The remaining State of Montana solid waste disposal requirements identified above do not apply to Waste Management Areas, including Opportunity Ponds, or are not identified as ARARs in the ARWW&S OU ROD.

Point of Compliance: Roads on which waste materials may be transported.
Time of Compliance: During conduct of the Community Soils OU remedial action.

Montana Strip and Underground Mine Reclamation Act, M.C.A. § 82-4-201 and regulations .

In the Identification of ARARs appended to the Community Soils ROD, the Agencies stated that certain discrete portions of the following regulatory provisions, to the extent they address changes in water quality and quantity, grading requirements, erosion control, and stabilization measures, may be relevant and appropriate for the replacement of residential soils and/or the management of removed soils in an onsite disposal or consolidation area:

ARM § 26.4.501(3)(a) and (d) and (4). Backfill must be placed so as to minimize sedimentation, erosion, and leaching of acid or toxic materials into waters, unless otherwise approved.

ARM § 26.4.501(A)(1)(a) and (2). Final graded slopes will be 5:1 unless otherwise approved. If steeper, slopes must have a long term static safety factor of 1:3, not to exceed the angle of repose unless the existing grade of the area is steeper, in which case the existing grade meets this requirement. Disturbed areas must be blended with undisturbed ground to provide a smooth transition in topography.

ARM § 26.4.514. Final grading will be done along the existing contour in order to minimize subsequent erosion and instability, unless otherwise approved.

ARM § 26.4.519. Pertinent areas of the Community Soils OU where excavation will occur will be regraded to minimize settlement.

ARM § 26.4.631(l), (2), (3)(a) and (b). Disturbances to the prevailing hydrologic balance will be minimized. Changes in water quality and quantity, in the depth to groundwater and in the location of surface water drainage channels will be minimized, to the extent consistent with the selected remedial alternatives.

ARM § 26.4.633. Surface drainage from a disturbed area must be treated by the best technology currently available (BTCA). Treatment must continue until the area is stabilized.

ARM § 26.4.638(1)(a) and (c) and (2). Practices to prevent or minimize sedimentation and erosion will employed to the extent possible.

<u>ARM § 26.4.634</u>. Disturbed drainages will be restored to the approximate pre-disturbance configuration, to the extent consistent with the selected remedial alternatives.

<u>ARM § 26.4.638(2)</u>. Sediment control measures must be implemented during operations.

<u>ARM § 26.4.641</u>. Practices to prevent drainage from acid or toxic forming spoil material into ground and surface water will be employed.

<u>ARM § 26.4.702(4), (5) and (6)</u>. Practices to prevent compaction, slippage, erosion, and deterioration of biological properties of soil will be employed, if necessary, as specified in the CS OU RAWP/FDRs.

<u>ARM § 26.4.703</u>. When using materials other than, or along with, soil for final surfacing in reclamation, the operator must demonstrate that the material (1) is at least as capable as the soil of supporting the approved vegetation and subsequent land use, and (2) the medium must be the best available in the area to support vegetation. Such substitutes must be used in a manner consistent with the requirements for redistribution of soil in ARM § 26.4.701 and 702.

<u>ARM § 26.4.711</u>. Requires that a diverse, effective and permanent vegetative cover of the same seasonal variety and utility as the vegetation native to the area of land to be affected must be established. This provision is not relevant or appropriate to sodded or graveled lots, including residential yards.

<u>ARM § 26.4.713</u>. Seeding and planting of disturbed areas must be conducted during the first appropriate period for favorable planting after final seedbed preparation but may not be more than 90 days after soil has been replaced, unless the area is to be sodded.

<u>ARM § 26.4.714</u>. Mulch or cover crop or both must be used until adequate permanent cover can be established.

<u>ARM § 26.4.716</u>. Establishes method of revegetation.

<u>ARM § 26.4.718</u>. Requires soil amendments, irrigation, management, fencing, or other measures, if necessary to establish a diverse and permanent vegetative cover.

<u>ARM § 26.4.728</u>. Sets forth requirements for the composition of vegetation on reclaimed areas.

<u>ARM § 26.4.751</u>. Measures to prevent degradation of fish and wildlife habitat will be employed.

<u>ARM § 26.4.761(2)(a), (e), (h), (j) and (k)</u>. These provisions specify fugitive dust control measures which will be employed during excavation and construction activities to minimize the emission of fugitive dust in the Community Soils OU. These provisions are addressed below in Section III.C.

In conducting the residential soils portion of the Community Soils remedial action, backfill will be placed in yards where soil is removed, and will be covered with sod or seeded with grass, unless the soils were removed from driveways or similar features, in which case the backfill will be stabilized and covered with appropriate material. In conducting the railbed portion of the Community Soils remedial action, backfill will be placed so as to minimize sedimentation, erosion, and leaching of acid or toxic materials into waters.

Final graded slopes will be 5:1 where possible, and disturbed areas will be blended with undisturbed ground to provide a smooth transition in topography. Slopes will be graded to match the existing slope or the slope will be reduced where disturbed. In areas where the grade may exceed 3:1 best management practices will be employed to stabilize the slope and to prevent erosion.

It is not anticipated that remedial action activities will disturb the prevailing hydrologic balance. Neither are remedial action activities anticipated to cause adverse changes in water quality, or changes in water quantity, in the depth to groundwater and in the location of surface water. Surface drainage is not anticipated from disturbed areas, and the remedial action activities will not affect existing drainages. Disturbed areas will be revegetated or covered with a rock cover. Sediment control measures and other best management practices will be employed where necessary to prevent sediment from entering surface waters, and to prevent erosion, slippage, and compaction of disturbed soils.

Soils used for backfill will meet requisite specifications. Residential yards and other areas of dedicated development will be sodded or otherwise revegetated. Sod will be laid as yard cleanups are completed, and reseeding will be conducted during the first appropriate period for favorable planting after final seedbed preparation. Any care required to maintain the revegetated areas on private and/or residential properties, such as irrigation, fencing, etc., will be the responsibility of the property owner. Certain residential areas that are revegetated will be seeded with a diverse and permanent seed mix.

Point of Compliance: Within the area of remedial action activities.
Time of Compliance: During and following conduct of remedial action activities

Air Requirements.

Remedial activities will comply with the following requirements to ensure that existing air quality will not be adversely affected by the Community Soils OU remedial action.

ARM § 16.8.1401(2), (3), and (4) (renumbered ARM § 17.8.308) – requiring emissions of airborne particulate matter to be controlled.

ARM § 16.8.1404(2) (renumbered ARM § 17.8.304) – prohibiting emissions into the outdoor atmosphere exhibiting an opacity of 20% or greater averaged over 6 consecutive minutes.

ARM § 16.8.1427 (renumbered ARM § 17.8.315) – requiring control of gases, vapors and dusts such that no public nuisance is caused within the Community Soils OU.

ARM § 26.4.761(2)(a), (e), (h), (j) and (k) – requiring implementation of fugitive dust control measures such as 1) watering, stabilization, or paving of roads, 2) vehicle speed restrictions, 3) stabilization of surface areas adjoining roads, 4) restriction of travel on other than authorized roads, 5) enclosing, covering, watering, or otherwise treating loaded haul truck, 6) minimizing area of disturbed land, and 7) revegetation.

ARM § 16.8.815 (renumbered ARM § 17.8.222) – prohibiting the concentration of lead in ambient air from exceeding a 90-day average of 1.5 micrograms per cubic meter of air.

ARM § 16.8.818 (renumbered ARM § 17.8.220) – prohibiting settled particulate matter from exceeding a 30-day average of 10 grams per square meter.

ARM § 16.8.821 (renumbered ARM § 17.8.223 – prohibiting the concentration of PM-10 in ambient air from exceeding a 24-hour average of 150 micrograms per cubic meter of air and an annual average of 50 micrograms per cubic meter of air.

It is expected that standard construction dust suppression practices, such as periodic wetting, will satisfy the above-described requirements. Equipment used during the remedial action activities will be equipped with all standard or required pollution control devices.

Point of Compliance: Within the area of remedial action activities.
Time of Compliance: During remedial action construction.

APPENDIX H

DUST SAMPLING
RESIDENTIAL OCCUPANT QUESTIONNAIRE

Anaconda Smelter NPL Site – Community Soils Operable Unit
Dust Sampling Residential Occupant Questionnaire

1. Geocode:________________________________
2. Property Address:_________________________
3. Name of Homeowner:____
4. Is this a Rental Property?____
5. Name of Occupant(s):____
6. Number of Occupants and Ages____
   ____
7. Are there any pregnant women in the home?__________________________________
8. Year house was built:____
9. How often do you access the attic?
   Once/Week__________ Once/Month________ Once/Year__________ Other_______
10. Is the ceiling directly below the attic in good condition? Yes / No

APPENDIX I

SUSPECTED LEAD PAINT
NOTIFICATION LETTER

Atlantic Richfield Company

317 Anaconda Road
Butte, MT 59701
Main (406) 782-9964
Fax (406) 782-9980

May 1, 2015

Carl Nyman
Anaconda-Deer Lodge County
Superfund Coordinator
800 South Main Street
Anaconda, MT 59711

Dear Mr. Nyman:

As you are aware, Atlantic Richfield sampling crews are currently collecting Community Soil (CS) Operable Unit residential soil and attic dust samples pursuant to the CS Record of Decision and Record of Decision Amendment issued by the United States Environmental Protection Agency (EPA) with concurrence by the State of Montana Department of Environmental Quality (MDEQ).

During last month's sampling operations, some residential properties were identified as potentially containing exterior lead paint. These properties are listed in the attached spreadsheet. For these properties, this letter shall serve as official notification and start of the 12-month period homeowners are given to abate suspected lead paint in advance of remedial action clean-up activities.

If you have any questions or concerns, please contact me at 406-723-1832.

Sincerely,

Luke Pokorny

Luke Pokorny
Atlantic Richfield Company
Project Manager

Attachments: List of Homes with Potential Lead Paint

cc: Charlie Coleman/EPA
Joel Chavez/MDEQ

APPENDIX J

SAMPLE RESULTS LETTERS

Appendix J-1:	**No Action Soil Sampling Results Letter**
Appendix J-2:	**Remedial Action Soil Sampling Results Letter**
Appendix J-3:	**No Action Attic Dust Sampling Results Letter**
Appendix J-4:	**Remedial Action Attic Dust Sampling Results Letter**

APPENDIX J-1

NO ACTION
SOIL SAMPLING RESULTS LETTER

Atlantic Richfield Company

317 Anaconda Road
Butte, MT 59701
Main (406) 782-9964
Fax (406) 782-9980

May 1, 2015

John Doe
111 Main Street
Anaconda, MT 59711

Dear Landowner:

This letter is in response to soil sampling activities conducted within the Community Soils (CS) Operable Unit of the Anaconda Smelter National Priority List Site by Atlantic Richfield Company on your property. Soil sampling was conducted pursuant to the CS Record of Decision and the Record of Decision Amendment issued by the United States Environmental Protection Agency (EPA) with concurrence by the State of Montana Department of Environmental Quality (MDEQ), and under the direct supervision of the EPA. On behalf of the EPA and Atlantic Richfield Company, we would like to provide you the results from the sampling that was conducted on your property.

The arsenic and lead concentrations for soil samples collected from your property are attached to this letter. Your results are below the action levels for arsenic and lead established by the EPA for residential soils within the Anaconda Smelter Superfund Site. Therefore, further sampling or remediation is not required in your residential yard.

As a reminder, future development activities within the county must still be approved through the Anaconda-Deer Lodge County (ADLC) Development Permit System (DPS). The ADLC-DPS requires a permit for all land development and building activities, including: clearing, grading, excavation, and construction activities. Questions concerning the ADLC-DPS may be addressed to the ADLC Planner at (406) 563-4010.

We would like to thank you for your cooperation during this effort. If you have any questions or require further explanation concerning the above information, please give me a call at the number listed below. Alternatively, you may also call Charlie Coleman with the EPA (406-457-5038) or Joel Chavez with the MDEQ (406-841-5031) with any questions or concerns.

Sincerely,

Luke Pokorny
Atlantic Richfield Company
Project Manager
406-723-1832

Attachment: Analytical Soil Sampling Results

cc: Charlie Coleman/EPA
Joel Chavez/DEQ

ANALYTICAL RESULTS FROM SOIL SAMPLING
CONDUCTED ON YOUR PROPERTY

Geocode: _______________

Tax Parcel ID: _______________

Physical Address: _______________

Legal Description: _______________

Residential ID: _______________

ANALYTICAL SOIL SAMPLING RESULTS										
RESIDENTIAL YARD COMPONENTS	**COMPONENT ARSENIC CONCENTRATION (ppm)**					**COMPONENT LEAD CONCENTRATION (ppm)**				
	0-2"	**2-6"**	**6-12"**	**12-18"**	**18-24"**	**0-2"**	**2-6"**	**6-12"**	**12-18"**	**18-24"**
AREA WEIGHTED AVERAGE (AWA)	234.7	221.5	192.3	215.0	117.0	N/A	N/A	N/A	N/A	N/A
BOULEVARD (BV)	465	150	255	N/A	N/A	191	248	315	N/A	N/A
FRONT YARD (FY)	112	251	137	N/A	N/A	255	201	313	N/A	N/A
FLOWER GARDEN (FG)	211	138	158	215	117	117	211	187	313	290
BACK YARD (BY)	393	452	220	N/A	N/A	334	337	341	N/A	N/A
EARTHEN DRIVE (ED)	240	233	187	N/A	N/A	337	375	269	N/A	N/A
	Composite Arsenic AWA is ≥ 250 ppm.									
	Composite Arsenic AWA and Component Arsenic Concentration is ≥ 250 ppm.									
	Component Arsenic Concentration is ≥ 250 ppm (Vegetable and Flower Gardens Only)									
	Component Lead Concentration is ≥ 400 ppm.									

EPA Action Levels to Determine the Need for Additional Testing or Remediation in Residential Soils:

Arsenic in Residential Yards: Area Weighted Average (AWA) ≥ 250 ppm and Yard Component ≥ 250 ppm
Arsenic in Residential Gardens: Garden Component ≥ 250 ppm
Lead in Residential Yards: Any Yard Component ≥ 400 ppm
Lead in Residential Gardens: Garden Component ≥ 400 ppm

Definitions of words and abbreviations used above:

COMPOSITE SAMPLE – A combination of individual samples, taken at a given depth interval, combined into a single sample.

AREA WEIGHTED AVERAGE (AWA) – The average of the concentrations of arsenic measured throughout the residential yard at any given depth interval, weighted by the size of each yard component.

PARTS PER MILLION (PPM) – Parts per million, an expression of concentration. A good analogy: If you had 20ppm, it would be like having 20 white marbles and 999,980 black marbles in a group of 1,000,000 total marbles.

APPENDIX J-2

REMEDIAL ACTION
SOIL SAMPLING RESULTS LETTER

Atlantic Richfield Company

317 Anaconda Road
Butte, MT 59701
Main (406) 782-9964
Fax (406) 782-9980

May 1, 2015

John Doe
111 Main Street
Anaconda, MT 59711

Dear Landowner:

This letter is in response to soil sampling activities conducted within the Community Soil (CS) Operable Unit of the Anaconda Smelter National Priority List by Atlantic Richfield Company on your property. Soil sampling was conducted pursuant to the CS Record of Decision and the Record of Decision Amendment issued by the United States Environmental Protection Agency (EPA) with concurrence by the State of Montana Department of Environmental Quality (MDEQ), and under the direct supervision of the EPA. On behalf of the EPA and Atlantic Richfield Company, we would like to provide you the results from the sampling that was conducted on your property.

The arsenic and lead concentrations for soil samples collected from your property are attached to this letter. Your results indicate that the concentrations of arsenic and/or lead detected in your yard exceed the current residential soil action level(s) established by the EPA for residential soils within the Anaconda Smelter Superfund Site. Therefore, some or all of your property will be eligible for soil remediation.

We will soon be mailing you additional information about the soil remediation to be performed in your yard. The additional information will include a work plan, which describes the specific work proposed for your yard, and an access agreement form, through which you can provide permission to Atlantic Richfield Company to perform this work. These documents and the proposed work will be subject to your review and approval, and also must be approved by the EPA. Once all of the plans have been finalized and approved, we will contact you to schedule the remediation work.

We would like to thank you for your cooperation during this effort. If you have any questions or require further explanation concerning the above information, please give me a call at the number listed below. Alternatively, you may also call Charlie Coleman with the EPA (406-457-5038) or Joel Chavez with the MDEQ (406-841-5031) with any questions or concerns.

Sincerely,

Luke Pokorny
Atlantic Richfield Company
Project Manager
406-723-1832

Attachments: Analytical Soil Sampling Results

cc: Charlie Coleman/EPA
Joel Chavez/DEQ

ANALYTICAL RESULTS FROM SOIL SAMPLING
CONDUCTED ON YOUR PROPERTY

Geocode: _______________

Tax Parcel ID: _______________

Physical Address: _______________

Legal Description: _______________

Residential ID: _______________

ANALYTICAL SOIL SAMPLING RESULTS										
RESIDENTIAL YARD COMPONENTS	**COMPONENT ARSENIC CONCENTRATION (ppm)**					**COMPONENT LEAD CONCENTRATION (ppm)**				
	0-2"	**2-6"**	**6-12"**	**12-18"**	**18-24"**	**0-2"**	**2-6"**	**6-12"**	**12-18"**	**18-24"**
AREA WEIGHTED AVERAGE (AWA)	283.7	334.0	192.3	215.0	117.0	N/A	N/A	N/A	N/A	N/A
BOULEVARD (BV)	465	150	255	N/A	N/A	191	248	315	N/A	N/A
FRONT YARD (FY)	112	251	137	N/A	N/A	255	512	313	N/A	N/A
FLOWER GARDEN (FG)	343	138	315	215	117	117	412	582	313	290
BACK YARD (BY)	393	452	220	N/A	N/A	785	337	341	N/A	N/A
EARTHEN DRIVE (ED)	240	233	187	N/A	N/A	337	375	482	N/A	N/A
	Composite Arsenic AWA is ≥ 250 ppm.									
	Composite Arsenic AWA and Component Arsenic Concentration is ≥ 250 ppm.									
	Component Arsenic Concentration is ≥ 250 ppm (Vegetable and Flower Gardens Only)									
	Component Lead Concentration is ≥ 400 ppm.									

EPA Action Levels to Determine the Need for Additional Testing or Remediation in Residential Soils:

Arsenic in Residential Yards: Area Weighted Average (AWA) ≥ 250 ppm and Yard Component ≥ 250 ppm
Arsenic in Residential Gardens: Garden Component ≥ 250 ppm
Lead in Residential Yards: Any Yard Component ≥ 400 ppm
Lead in Residential Gardens: Garden Component ≥ 400 ppm

Definitions of words and abbreviations used above:

COMPOSITE SAMPLE – A combination of individual samples, taken at a given depth interval, combined into a single sample.

AREA WEIGHTED AVERAGE (AWA) – The average of the concentrations of arsenic measured throughout the residential yard at any given depth interval, weighted by the size of each yard component.

PARTS PER MILLION (PPM) – Parts per million, an expression of concentration. A good analogy: If you had 20ppm, it would be like having 20 white marbles and 999,980 black marbles in a group of 1,000,000 total marbles.

APPENDIX J-3

NO ACTION
ATTIC DUST SAMPLING RESULTS LETTER

Atlantic Richfield Company

317 Anaconda Road
Butte, MT 59701
Main (406) 782-9964
Fax (406) 782-9980

May 1, 2015

John Doe
111 Main Street
Anaconda, MT 59711

Dear Landowner:

This letter is in response to attic dust sampling activities conducted within the Community Soils (CS) Operable Unit of the Anaconda Smelter National Priority List Site by Atlantic Richfield Company on your property. Attic dust sampling was conducted pursuant to the CS Record of Decision Amendment issued by the United States Environmental Protection Agency (EPA) with concurrence by the State of Montana Department of Environmental Quality (MDEQ), and under the direct supervision of the EPA. On behalf of the EPA and Atlantic Richfield Company, we would like to provide you the results from the sampling that was conducted on your property.

The arsenic and lead concentrations for attic dust samples collected from your property are attached to this letter. Your results are below the action levels for arsenic and lead established by the EPA for residential attic dust within the Anaconda Smelter Superfund Site. Therefore, further sampling or remediation is not required in your attic.

As a reminder, future development activities within the county must still be approved through the Anaconda-Deer Lodge County (ADLC) Development Permit System (DPS). The ADLC-DPS requires a permit for all land development and building activities, including: clearing, grading, excavation, and construction activities. Questions concerning the ADLC-DPS may be addressed to the ADLC Planner at (406) 563-4010.

We would like to thank you for your cooperation during this effort. If you have any questions or require further explanation concerning the above information, please give me a call at the number listed below. Alternatively, you may also call Charlie Coleman with the EPA (406-457-5038) or Joel Chavez with the MDEQ (406-841-5031) with any questions or concerns.

Sincerely,

Luke Pokorny
Atlantic Richfield Company
Project Manager
406-723-1832

Attachment: Analytical Attic Dust Sampling Results

cc: Charlie Coleman/EPA
Joel Chavez/DEQ

ANALYTICAL RESULTS FROM ATTIC DUST SAMPLING
CONDUCTED ON YOUR PROPERTY

Geocode: ______________

Tax Parcel ID: ______________

Physical Address: ______________

Legal Description: ______________

Residential ID: ______________

ANALYTICAL ATTIC DUST SAMPLING RESULTS		
COMPONENT	**COMPONENT ARSENIC CONCENTRATION (ppm)**	**COMPONENT LEAD CONCENTRATION (ppm)**
ATTIC	222	191
	COMPOSITE ARSENIC CONCENTRATION ≥ 250 ppm	
	COMPONENT LEAD CONCENTRATION IS ≥ 400 ppm	

EPA Action Levels to Determine the Need for Additional Testing or Remediation of Attic Dust:

Arsenic in Attic Dust ≥ 250 ppm
Lead in Attic Dust ≥ 400 ppm

Definitions of words and abbreviations used above:

COMPOSITE SAMPLE – A combination of individual samples, taken at a given depth interval, combined into a single sample.

PARTS PER MILLION (PPM) – Parts per million, an expression of concentration. A good analogy: If you had 20ppm, it would be like having 20 white marbles and 999,980 black marbles in a group of 1,000,000 total marbles.

APPENDIX J-4

REMEDIAL ACTION
ATTIC DUST SAMPLING RESULTS LETTER

Atlantic Richfield Company

317 Anaconda Road
Butte, MT 59701
Main (406) 782-9964
Fax (406) 782-9980

May 1, 2015

John Doe
111 Main Street
Anaconda, MT 59711

Dear Landowner:

This letter is in response to attic dust sampling activities conducted within the Community Soil (CS) Operable Unit of the Anaconda Smelter National Priority List by Atlantic Richfield Company on your property. Attic dust sampling was conducted pursuant to the CS Record of Decision Amendment issued by the United States Environmental Protection Agency (EPA) with concurrence by the State of Montana Department of Environmental Quality (MDEQ), and under the direct supervision of the EPA. On behalf of the EPA and Atlantic Richfield Company, we would like to provide you the results from the sampling that was conducted on your property.

The arsenic and lead concentrations for attic dust samples collected from your property are attached to this letter. Your results indicate that the concentrations of arsenic and/or lead detected in your attic exceed the current residential attic dust action level(s) established by the EPA for the Anaconda Smelter Superfund Site. Therefore, your property will be eligible for attic dust remediation.

We will soon be mailing you additional information about the attic dust remediation to be performed at your property. The additional information will include a work plan, which describes the specific work proposed for your property, and an access agreement form, through which you can provide permission to Atlantic Richfield Company to perform this work. These documents and the proposed work will be subject to your review and approval, and also must be approved by the EPA. Once all of the plans have been finalized and approved, we will contact you to schedule the remediation work.

We would like to thank you for your cooperation during this effort. If you have any questions or require further explanation concerning the above information, please give me a call at the number listed below. Alternatively, you may also call Charlie Coleman with the EPA (406-457-5038) or Joel Chavez with the MDEQ (406-841-5031) with any questions or concerns.

Sincerely,

Luke Pokorny
Atlantic Richfield Company
Project Manager
406-723-1832

Attachments: Analytical Attic Dust Sampling Results

cc: Charlie Coleman/EPA
Joel Chavez/DEQ

ANALYTICAL RESULTS FROM ATTIC DUST SAMPLING
CONDUCTED ON YOUR PROPERTY

Geocode: _______________

Tax Parcel ID: _______________

Physical Address: _______________

Legal Description: _______________

Residential ID: _______________

ANALYTICAL ATTIC DUST SAMPLING RESULTS		
COMPONENT	**COMPONENT ARSENIC CONCENTRATION (ppm)**	**COMPONENT LEAD CONCENTRATION (ppm)**
ATTIC	222	451
	COMPOSITE ARSENIC CONCENTRATION ≥ 250 ppm	
	COMPONENT LEAD CONCENTRATION IS ≥ 400 ppm	

EPA Action Levels to Determine the Need for Additional Testing or Remediation of Attic Dust:

Arsenic in Attic Dust ≥ 250 ppm
Lead in Attic Dust ≥ 400 ppm

Definitions of words and abbreviations used above:

COMPOSITE SAMPLE – A combination of individual samples, taken at a given depth interval, combined into a single sample.

PARTS PER MILLION (PPM) – Parts per million, an expression of concentration. A good analogy: If you had 20ppm, it would be like having 20 white marbles and 999,980 black marbles in a group of 1,000,000 total marbles.